FOOD MANUFACTURE

Incorporating Food Industries Weekly

A PUBLICATION OF THE LEONARD HILL TECHNICAL GROUP AUGUST 1, 1957

LIBRARY
AUG 20 1957
UNIVERSITY OF MASSACHUSETTS
Department Food Technology
University of Massachusetts
Amherst, Massachusetts

Stacking Bowls

An extremely robust container of 16" diameter × 8½" or 12" or 15½" deep—3, 7½ or 10 gallons capacity respectively. Manufactured from 10 gauge aluminium with drop down, or fixed, side handles and stacking feature. Used in a wide variety of trades for the conveying or storage of all kinds of wet or dry foods. All sizes interstack and lids can also be provided.

WARWICK
'WARCO'
REGD. TRADE MARK
ENGLAND
First Choice for Aluminium Equipment

WARWICK PRODUCTION COMPANY LTD

IN ASSOCIATION WITH **ALMIN LIMITED** STOKE POGES BUCKS

BIRMINGHAM ROAD · WARWICK · Telephone WARWICK 693-696

The six finishing stands of the 80" continuous hot strip mill at Abbey Works

One-third of Britain's Sheet Steel and
two-thirds of Britain's Tinplate are made by

THE STEEL COMPANY OF WALES LIMITED

ENQUIRIES TO THE SALES MANAGER:

Sheet and Plate—Abbey Works, Port Talbot, Glamorgan
Electrical Sheet—Orb Works, Newport, Monmouthshire
Tinplate and Blackplate—Carmarthen Road, Swansea, Glamorgan

Portrait of a Master Sausage-Maker

The Master is the man who knows how to take advantage of every advance in sausage-making technique. He knows that MSB will improve any mixture, no matter how good it may already be.

MSB is non-glutinous and soluble in meat juices and water. It *penetrates* into the tissues of the meat, emulsifying lean and fat together, and sealing in the natural juices. The escape of these juices into the water in the mixture causes loss of colour. By sealing them in, therefore, MSB improves colour and flavour.

Because it is non-glutinous, MSB enables as much fat as lean to be used.

MSB binds rusk and seasoning into an integrated whole with the meat. Texture is completely even and consistent from chopping to chopping.

MSB is of the greatest value in canning sausages, frankfurters and luncheon meat.

When used for curing hams, tongues, ox-breast, silversides, etc., the curing time is speeded up, the colour and flavour improved, and high cooking losses are prevented.

MSB is equally good for small goods and cooked meats. See for yourself—send today for a 7 lb. sample. Also available in 3 oz. packets in minimum quantities of 6 lb.

M S B

- **binds all ingredients into an even meaty texture**
- **enables equal parts of meat and fat to be used because it is non-glutinous**
- **improves colour and flavour**
- **works fast, and cuts curing time for cooked meats by a third**

MSB

makes sausages better

MANUFACTURED BY: **FOODTECH LTD., Queen Anne's Place Bush Hill Park, Enfield, Middx. Phone: LABurnum 6656/7**

ALSO MARKETED BY: *The Oppenheimer Casing Co. (U.K.) Ltd., 159-165 Harrow Road ,W.2. PADdington 7431*

Index to ADVERTISERS

	Page
Abbott & Co. (Newark), Ltd.	lxxxv
Abix (Metal Industries), Ltd.	lxxxix
Acalor, Ltd.	Mar.
A.C.V. Sales, Ltd.	May
Advita, Ltd.	July
Agricultural & Chemical Products Ltd.	xciv
Airguard, Ltd.	Feb.
Albro Fillers & Engg. Co., Ltd.	lxxviii
Alfa-Laval Co., Ltd.	xvii
Alite Machines, Ltd.	lxxxiv
Allen, Stafford, & Sons, Ltd.	xlv
Angel Warehouses Co., Ltd.	Mar.
Anhydro, A/S	July
Apex Construction, Ltd.	xiii
Arenco, Ltd.	July
Ascot Gas Water Heaters, Ltd.	Jan.
Associated Metal Works, Ltd.	xc
Auto Wrappers (Sales), Ltd.	lxxxviii
Bacon, W. C., & Co., Ltd.	July
Barron, W. S., & Sons, Ltd.	lxxxvi
Barry Wehmiller Machinery	April
Bear Honey Co., Ltd.	lxxx
Beddington Nut & Produce Co., Ltd.	xcii
Begg, Cousland & Co., Ltd.	lxxxii
Bellingham & Stanley, Ltd.	xcii
Benjamin Electric, Ltd.	June
Bennett Sons & Shears, Ltd.	lxx
Betts & Co., Ltd.	April
Bliss, E. W. (England), Ltd.	xlvii
Boehm, Fredk., Ltd.	lii
Boulton, William, Ltd.	x
Bowater Sales Corpn., Ltd.	Jan.
Bramigk & Co., Ltd.	xxxi
Bramwell, S., & Co., Ltd.	lxx
Brierley, Wm., Collier & Hartley, Ltd.	lxviii
British American Product Co., Ltd.	lxxxvi
British Arkady Co., Ltd.	lxxxviii
British Belting & Asbestos, Ltd.	May
British Ceca Co., Ltd., The	lxxxiv
British Celanese, Ltd.	July
British Cellophane, Ltd.	July
British Electrical Development Association	lxix
British Hydrological Corporation	July
British Rayophane, Ltd.	lxvi
British Road Services	July
British Sidac, Ltd.	xliv
British Soya Products, Ltd.	Mar.
British Thomson-Houston Co. (Rugby)	xxxv
British Transport Commission	July
British Wedge Wire Co., Ltd.	Jan.
Broadbent, Thomas, & Sons, Ltd.	July
Brown & Forth, Ltd.	July
Brown & Polson, Ltd.	xxxix
Bruckner-Werke	lxxxvii
Bryan, Wm., Ltd.	lxxvi
Bush, W. J., & Co., Ltd.	July
Butterfield, W. P., Ltd.	viii
Butterley Co., Ltd.	July
B X Plastics, Ltd.	lxxxix
Calfos, Ltd.	July
Cambridge Instrument Co., Ltd.	April
Canning Town Glass Works, Ltd.	lxxxviii
Cashmore, John, Ltd.	xcii
Cassidy, Peter, Ltd.	lxxxvi
Chambon, Ltd.	Jan.
Clarke-Built, Ltd.	July
Clark, George, & Co., Ltd.	June
Clark, T. & C., Ltd.	liv
Coates Bros. Inks, Ltd.	July
Cohen, George, Sons & Co., Ltd.	x v
Colt Ventilation, Ltd.	xii
Commer Cars, Ltd.	xvi
Compressed Paper Packing, Ltd.	Mar.
Cona Coffee Machine Co.	April
Confectioners' Vegetable Colours & Fruit Essences Co., Ltd.	liv
Conveyancer Fork Trucks, Ltd.	May
Cooks, E., Packers, Ltd.	Jan.
Cooper McDougall & Robertson, Ltd.	xiv
C.P. Equipment, Ltd.	June
Craigmillar & British Creameries, Ltd.	li
Crofts (Engineers), Ltd.	xviii
Crompton Parkinson, Ltd.	June
Crookes Laboratories, Ltd.	July
Cuxson Gerrard & Co., Ltd.	May
Czechoslovak Exhibition	lxxxviii
Dale, John, Ltd.	xxix
Dalmas, Ltd.	lxxxiii
Daniels, S., & Co., Ltd.	x..iii
Danks, Edwin, & Co., Ltd.	xxviii
Davey, Paxman, & Co., Ltd.	xxxviii
Davis, Leon, & Co.	Feb.
Dawson Bros., Ltd.	July
Demby, Hamilton, & Co., Ltd.	Feb.
Dewey & Almy, Ltd.	June
Diagraph Stencil Machine Co., Ltd.	April
Dick, R. & J., Ltd.	lxxxi
D.M.P. Sales, Ltd.	lxxv
Dodge Bros. (Britain), Ltd.	July
Dodman, Alfred, & Co., Ltd.	lxviii
Donovan Electrical Co., Ltd.	lxxvii
Drakesons	xciii
Drayton Regulator & Instrument Co.	xliii
Duche, T. M., & Sons, Ltd.	lxxviii
Electropower Gears, Ltd.	lxvi
Enamelled Metal Products Corpn. (1933), Ltd.	xxiii
Escher Wyss, Ltd.	July
Evans, Norman, & Rais, Ltd.	May
Evans, Wm., Co., Ltd.	July
Eversheds & Vignoles, Ltd.	iv
Ewart Chainbelt Co., Ltd.	May
Extrusionwork, Ltd.	vi
Fabricca Macchine Industriali	xxxvi
Factory Equipment Exhibition	April
Felber Jucker & Co., Ltd.	lxvi
Fenner, J. H., & Co., Ltd.	June
Farranti, Ltd.	July
Fisher's Foils, Ltd.	liii
Fisons Milk Products, Ltd.	v
Flexibox, Ltd.	June
Flexile Metal Co., Ltd.	lxxiv
Follsain-Wycliffe Foundries, Ltd.	July
Foodtech, Ltd.	iii
Foster Instrument Co., Ltd.	July
Fox, Samuel, & Co., Ltd.	June
Fraser, J., & Son, Ltd.	July
Fruitcoop	June
Fuller Horsey, Sons & Cassell	xcii
Gas Council	Cover iv
General Electric Co., Ltd.	July
Gosheron, John, & Co., Ltd.	July
Greening, N., & Sons, Ltd.	July
Graviner Mnfg. Co., Ltd.	lxxxvii
Gunson, R. W. (Seeds), Ltd.	July
Hamburger, M., & Sons	xcvi
Hannover Fair	Mar.
Hanovia, Ltd.	June
Harvey, G. A., & Co. (London), Ltd.	lxxvii
Hawker & Co.	Mar.
Hesser, F. R.	Jan.
Heston Equipment Co., Ltd.	Cover iii
Hill Engg. Co. (Hull), Ltd., The Thomas	Mar.
Hodgkinson, James (Salford), Ltd.	lxxxiii
Holden & Brooke, Ltd.	July
Holroyd, John, Ltd.	May
Honeywell-Brown, Ltd.	Jan.
Honeywell & Stein, Ltd.	Mar.
Hopkinsons, Ltd.	July
Howard Pneumatic Engg. Co., Ltd.	xci
Howorth, James, Ltd.	July
Hunt, John (Bolton), Ltd.	lvi
Hustler, James, Ltd.	May
Imperial Chemical Industries, Ltd.	xxv, xli, xlii, lix
Incinerator Co., Ltd.	lxxxiv
Isopad, Ltd.	Jan.

ANALYSING THE PROBLEMS . . .

OF THE SMALLER LABORATORY

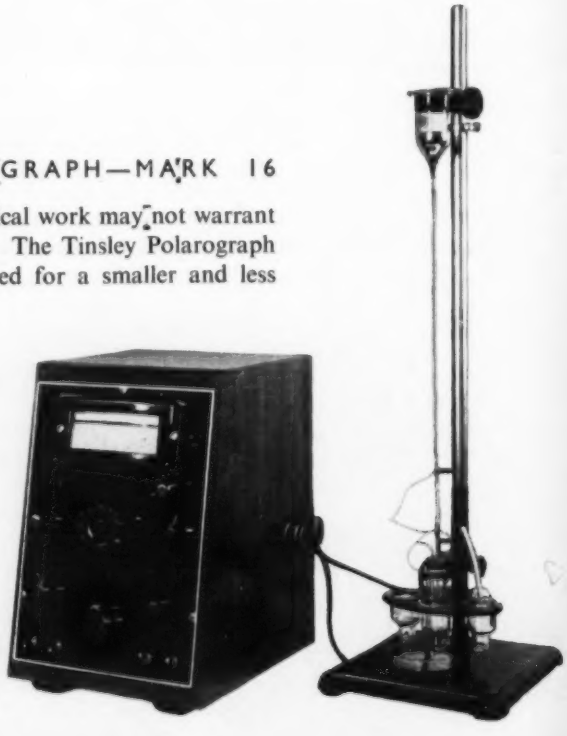
THE TINSLEY POLAROGRAPH—MARK 16

In many laboratories, the volume and scope of the analytical work may not warrant the outlay for the larger type of recording polarograph. The Tinsley Polarograph Mark 16 has therefore been introduced to meet the need for a smaller and less expensive instrument.

Although non-recording, the Polarograph Mark 16 retains many features of the larger instrument including the Derivative Circuit—it is the only non-recording polarograph to do so. The sensitivity is such that changes in current of 100 micro-micro-amperes can be detected.

For rapid and accurate chemical analysis, this Tinsley Polarograph is the ideal instrument for the smaller laboratory.

PLEASE WRITE FOR PUBLICATION FJ/288



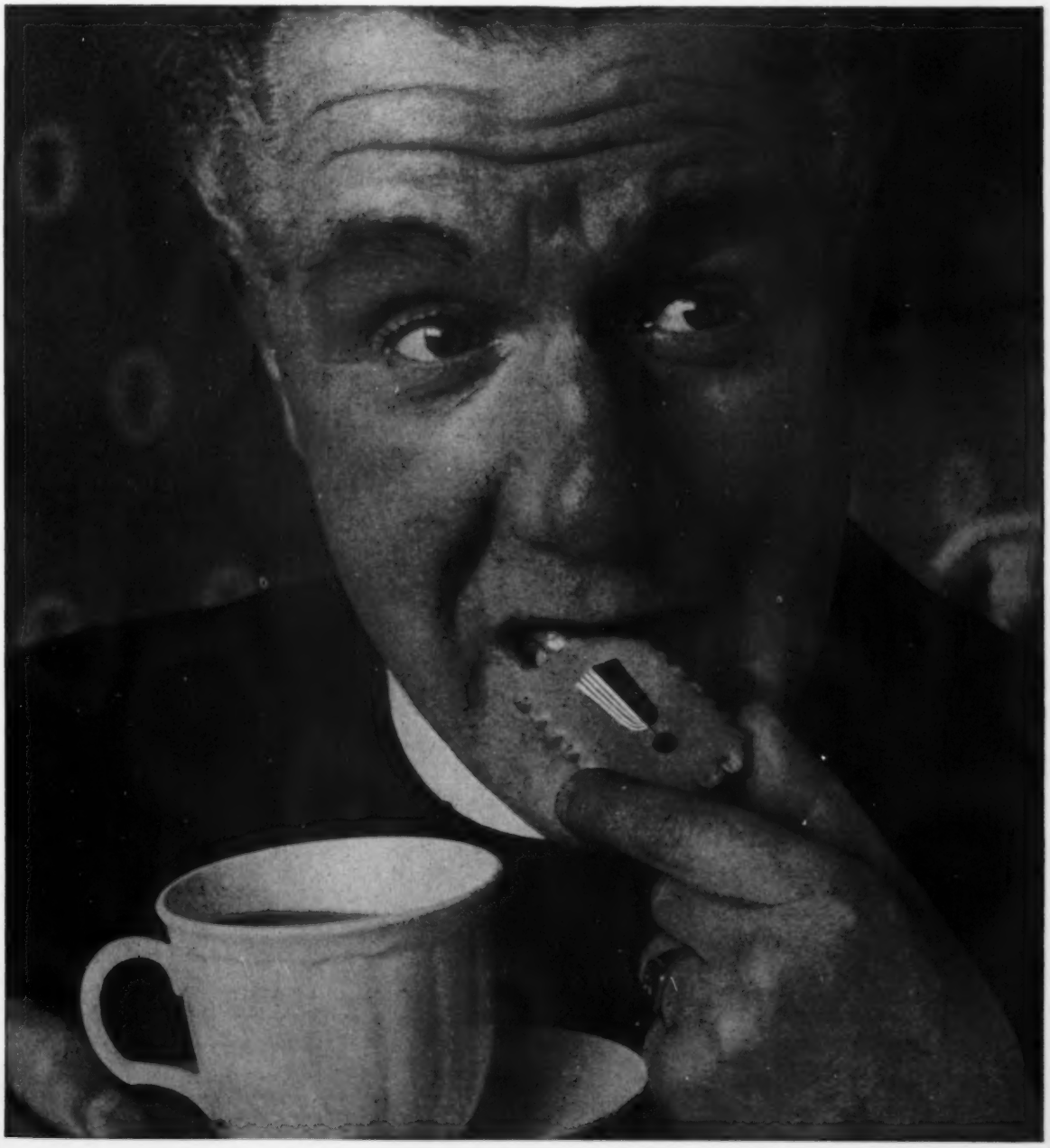
EVERSHED serves industry

EVERSHED & VIGNOLES LIMITED · ACTON LANE WORKS · CHISWICK · LONDON · W.4

TELEPHONE: CHISWICK 3670 TELEGRAMS AND CABLES: MEGGER, LONDON, TELEX 7/33

Fresh milk in the biscuits—good for the Vicar

A lot of pleasant social activity seems to revolve round a pot of tea and some biscuits. "People are so much more friendly like that" as the Vicar would say. But the tea has to be *just right* (. . . you know how particular they are about tea!) and the biscuits have to have that nice fresh creamy taste. And you can only get *that* with good fresh milk powder—COCKADE. If *your* business caters to this enormous market you'd do well to write or ring FISONS MILK PRODUCTS LIMITED, LOUGHBOROUGH, LEICESTERSHIRE. (Loughborough 2292.)

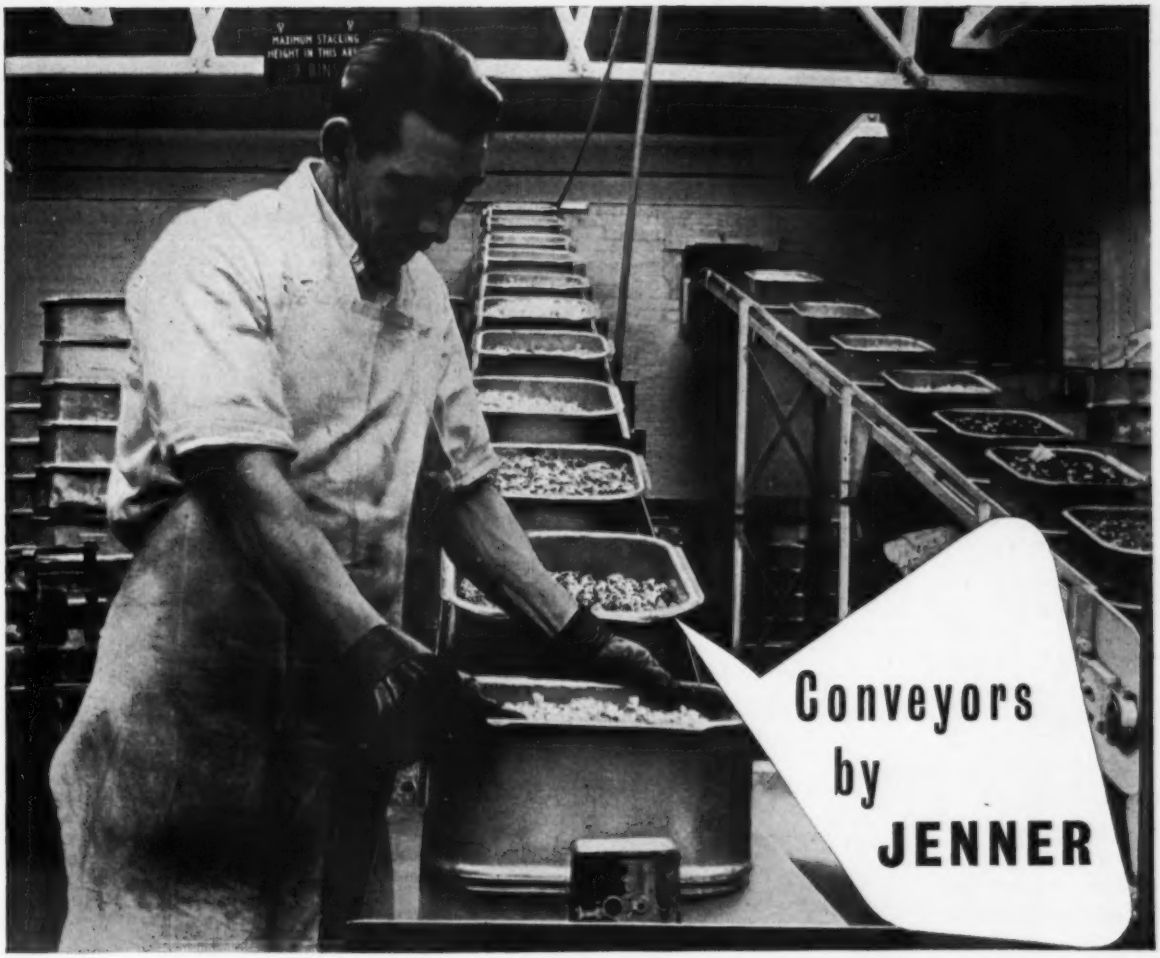


Cockade Reg'd. **the very cream of milk powders!**

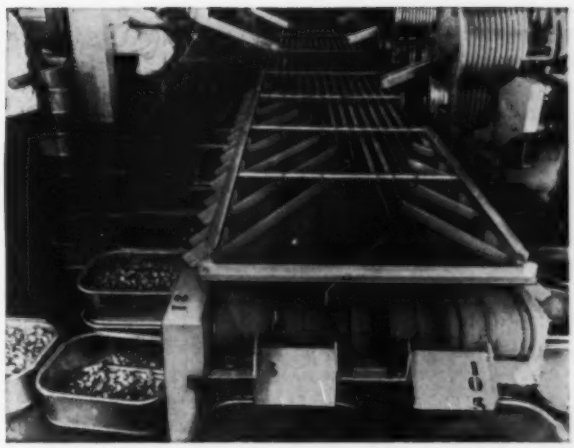
Index to ADVERTISERS

	Page
Jackson, J. G., & Crockatt, Ltd.	lxxxiv
Jenkins, Robert, & Co., Ltd.	July
Jenner, A. & C., Ltd.	vii
Johnson, A., & Co. (London), Ltd.	lxi
Kellie, R., & Son, Ltd.	xxi
Kemball, Bishop, & Co., Ltd.	Jan.
Kendall, F., & Son, Ltd.	xc
Key Glassworks, Ltd.	July
Kestner Evaporator & Engg. Co., Ltd.	July
Kingsbourne Products, Ltd.	lxiv
Kork-n-Seal, Ltd.	xxxiii
Lambert, L., & Co., Ltd.	July
Lautier Fils, Ltd.	April
Lawton (Successors), Ltd.	June
Loders & Nucoline, Ltd.	lxxii
London Fumigation Co., Ltd.	lxxix
London Oil Corporation, Ltd.	xcvi
McCraw Hill Publishing Co.	Mar.
Maitlands (Metal Works), Ltd.	July
Manbre & Garton, Ltd.	July
Manufacturers Equipment Co., Ltd.	June
Mason & Morton	lxxxi
Mather & Platt, Ltd.	xxxiv
May and Baker, Ltd.	July
Measurement, Ltd.	xxx
Megator Pumps and Compressors, Ltd.	May
Metaducts, Ltd.	xxxii
Metalfiltration Co., Ltd.	July
Metal Box Co., Ltd.	June
Metal Closures, Ltd.	July
Metal Propellers, Ltd.	July
Metalrax (Conveyors), Ltd.	Jan.
Milk Products (N.Z.), Ltd.	July
Minnesota Mining & Mnfg. Co., Ltd.	xxiv
Mitchell, L. A., Ltd.	lxxix
Mond Pumps, Ltd.	July
Monsanto Chemicals, Ltd.	July
Mountain, A. & F., Ltd.	July
Munton & Fison, Ltd.	xxii
National Glass Works (York), Ltd.	xxvi
Negretti & Zambra, Ltd.	May
Nipa Laboratories, Ltd.	July
Nordischer Maschinenbau Rud. Baader	lvi
Norman Engg. Co.	lx
Northern Publishing Co., Ltd.	July
Oppenheimer Casing Co. (U.K.)	lxxi
Ormerod Engineers, Ltd.	July
Oscard, James, & Co.	xc
Ova Fruit Products Company	April
Packaging Exhibition	Jan.
Padley & Venables, Ltd.	June
P.A.M., Ltd.	April
Paterson Hughes Engg. Co., Ltd.	xl
Payne, P. P., & Sons, Ltd.	Jan.
Pearlite Box Co., Ltd.	Jan.
Permali, Ltd.	April
Permoglaze, Ltd.	July
Permutit Co., Ltd.	xxxvii
Peters, G. D., Ltd.	xci
Peters, Robert, (Nottm.), Ltd.	July
Pilkington Bros., Ltd.	Mar.
Plenty & Son, Ltd.	lxxx
Polak & Schwarz (Eng.), Ltd.	xix
Pontifex, H., & Sons, Ltd.	June
Porteus, G., & Sons, Ltd.	lxiv
Potter, F. W., & Soar, Ltd.	xcii
Premier Filterpress Co., Ltd.	xcvi
Pulsometer Engg. Co., Ltd.	xcvi
Purdy Machinery Co., Ltd.	lxii
Pye, W. G., & Co., Ltd.	Mar.
Ransomes Sims & Jefferies, Ltd.	Mar.
Rayner & Co., Ltd.	lx
Reads, Ltd.	June
Reed Corrugated Cases, Ltd.	lv
Remploy, Ltd.	July
Renold Chains, Ltd.	lxiii
Rhoden Partners, Ltd.	July
Roche Products, Ltd.	ix
Rose, Downs & Thompson, Ltd.	lxii
Rubery Owen & Co., Ltd.	July
S.A. International Machinery Corp.	Feb.
Salisbury Precision Engg. Co., Ltd.	July
Samuelson, P., & Co.	May
Sanders, H. G., & Son, Ltd.	lvii
Saunders Valve Co., Ltd.	July
Scan, Ltd.	June
Schimmel Boehm, Ltd.	June
Scott-Reitz, Ltd.	July
Sellotape	lxv
Semtex, Ltd.	June
Senior Economisers, Ltd.	July
Sig Wrapping Machines, Ltd.	Jan.
Silber, L. I., & Co., Ltd.	lx xci, xc
Simon, Henry, Ltd.	xlix
Skerman, C., & Co., Ltd.	xcv
SMALL ADVERTISEMENTS	xciii-xcv
Smith & McLaurin, Ltd.	June
Soflor, Ltd.	July
South Coast Group	lxxiii
Spencer-Bonecourt-Clarkson, Ltd.	June
Spencer Hopwood, Ltd.	June
Spesco Developments, Ltd.	lxxxv
Stainless Steel Vessels (London), Ltd.	lxvii
Star Welding, Ltd.	Feb.
Steel Co. of Wales, Ltd., The	Cover ii
Stelcon (Industrial Floors), Ltd.	xxvii
Stevenson & Howell, Ltd.	July
Stokes & Dalton, Ltd.	xv
Sturge, J. & E., Ltd.	xlvi
Sunvic Controls, Ltd.	Jan.
Taylor Rustless Fittings Co., Ltd.	July
Technoexport	May
Telegraph Condenser Co., Ltd.	July
Telegraph Construction & Maintenance Co., Ltd.	June
Thames Board Mills, Ltd.	July
Thomas, Richard, & Baldwins, Ltd.	July
Trapow, D., & Co., Ltd.	June
Tweedy, George, & Co., Ltd.	May
U.D. Engineering Co., Ltd.	July
Union Food Machinery and Equipment, Ltd.	May
United Glass Bottle Manfrs., Ltd.	I
United Steel Companies, Ltd.	June
Universal Exhibitions	June
U.S. Autowash, Ltd.	July
Valrecchio, s.p.a.	xc
Venesta, Ltd.	June
Vickerys, Ltd.	lxxxii
Viscose Development Co., Ltd.	xlviii
Viskase, Ltd.	July
WAECO, Ltd. (Fumite Division)	lxxx
Walker, Crosweller & Co., Ltd.	July
Wallach Bros., Ltd.	Jan.
Warwick Production Co., Ltd.	Cover i
Webster, Isaac, & Sons, Ltd.	July
Webster, Ridgway, & Partners, Ltd.	April
Weir, G. & J., Ltd.	xi
Wetter, J. C., & Co., Ltd.	June
White, Thomas, & Sons, Ltd.	Jan.
Whittaker, Arthur	xciv
Willcox, W. H., & Co., Ltd.	xx
Williams (Hounslow), Ltd.	Mar.
York Shipley, Ltd.	July
Youngman, W. C., Ltd.	June

• P.V.C. (rigid & flexible)
• POLYTHENE
• ACETATE
• POLSTYRENE
• C.A.B. etc.
Extruded tubes, rods, sections, etc in all plastic materials
In innumerable applications, extruded piping and sheet in these non-toxic materials have proved their obvious advantages to the Food Manufacturing and Packaging Industries. We offer a comprehensive service covering research, design and manufacture, and we shall be pleased to help in your production plans.
Extrusionwork
EXTRUSIONWORK LTD · Wellington New Mill
Bolton Rd · Blackburn · Lancs
Tel.: Blakewater 85368



Jenner conveyor systems are individually designed-to-fit the process, so that the entire production line flows smoothly, and the factory, so that every inch of space is freed for productive use.

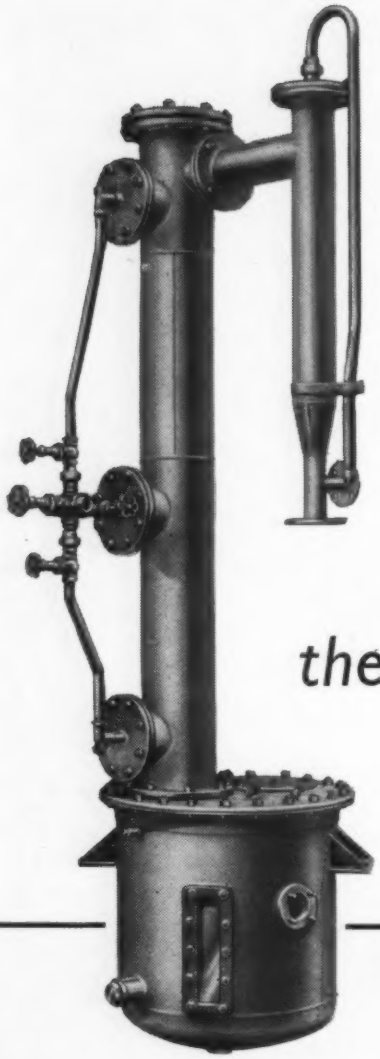


A & C JENNER Ltd

CLARENDON WORKS · MITCHAM · SURREY · Tel: Mitcham 4044/5

Specialists in mechanical handling equipment

·JENNER CONVEYORS keep things moving

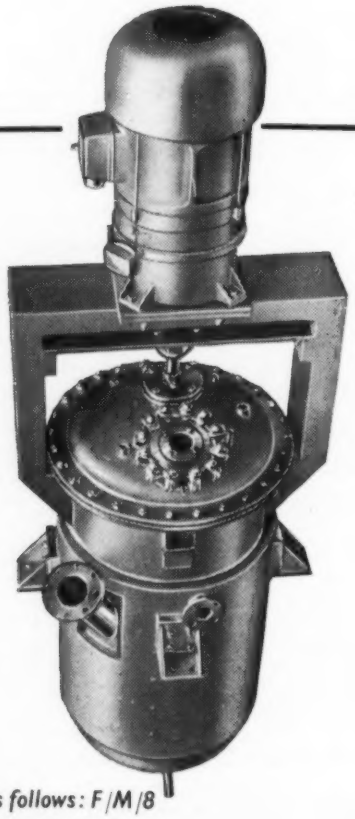


BUTTERFIELD Tanks, Vats and Vessels of Stainless Steel commend themselves as ideal for storage or processing of industrial liquids, because it neither reacts upon, nor is it acted upon by, the liquid it contains; as to cleanliness and hygiene, no surface is so readily cleaned and so readily kept clean.

Mutual respect . . .

the best working condition

LEFT: A Stainless Steel Process Vessel



Butterfield

Stainless Steel Equipment

RIGHT: A Stainless Steel Fermenting Vessel

For ease of reference please mark enquiries relating to this advertisement as follows: F/M/8

W. P. Butterfield Limited P.O. Box 38 Shipley Yorkshire Tel 52244 (8 lines)

Branches: LONDON Tel HOLborn 2455 (4 lines) BIRMINGHAM Tel EAS 0871 BRISTOL Tel 27905 LIVERPOOL Tel Central 0829 MANCHESTER Tel Blackfriars 9417 NEWCASTLE-ON-TYNE Tel 23823 GLASGOW Tel 7696 BELFAST N.I. Tel 57343 DUBLIN Tel 73475 & 79745

A desirable

Safe and

Uniform

YELLOW

BETA CAROTENE 'ROCHE'

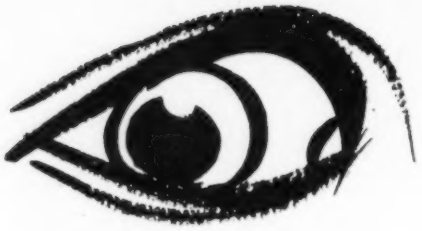
for colouring foods *Safely*

Highest standard of purity and uniformity with full biological activity. Available in forms convenient and easy to use for colouring:

* Margarine, shortening and liquid cooking oils
* Processed cheese
* Macaroni, Noodle and Spaghetti products
* Cake Mixes and Biscuits

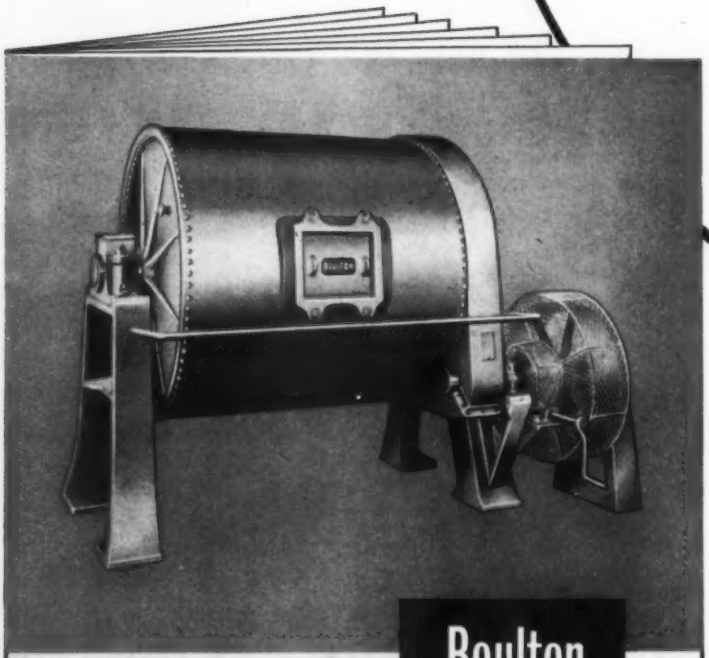
Prices and technical information from

ROCHE PRODUCTS LIMITED · 15 MANCHESTER SQUARE · LONDON · W.1



With an eye to a machine

In common with most industries, ball milling in recent years has seen a steady advance in technical design. Equipment has reached a high degree of specialisation and efficiency with a wide range of specifications to suit different processes. With these facts in mind Wm. Boulton Ltd. offer this booklet as a comprehensive guide to engineers and executives faced with the problem of selecting plant.

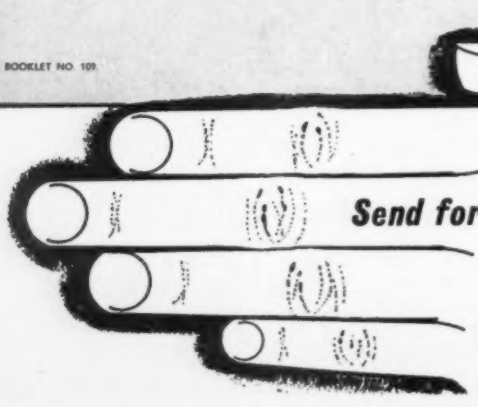


Boulton

Ball and Pebble Mills

BOOKLET NO. 109

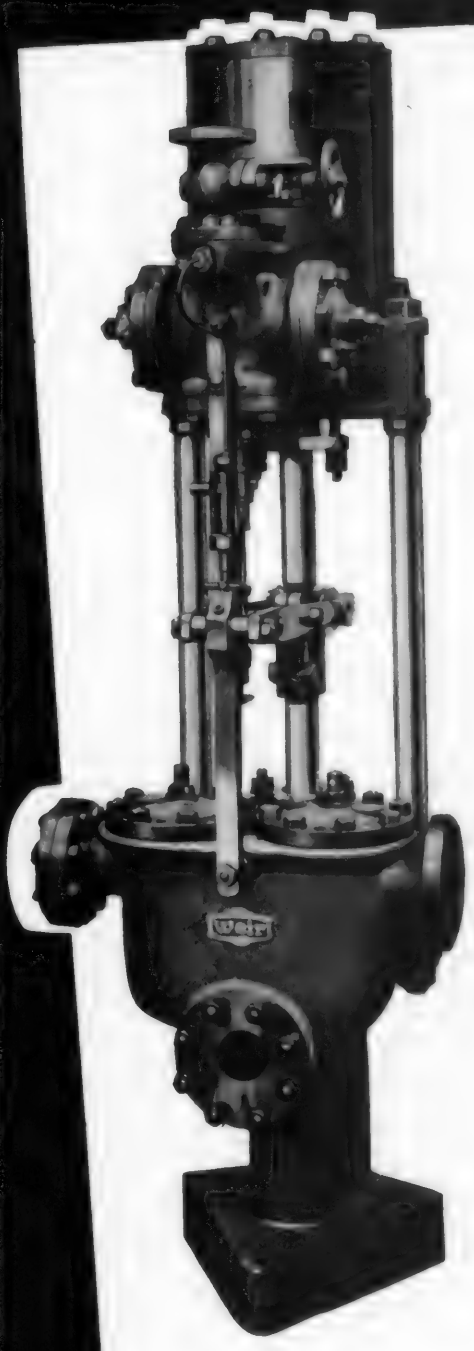
A mine of information



Send for this free booklet to

William Boulton Limited

PROVIDENCE ENGINEERING WORKS · BURSLEM · STOKE-ON-TRENT
Tel: Stoke-on-Trent 88661 (5 lines). Grams: BOULTON, BURSLEM



WEIR

Direct-Acting

FEED PUMPS

suitable for all types of boilers. Standard sizes and capacities for discharge pressures up to 300 lb./sq. in. Special designs for higher pressures. Universally recognised as the most reliable and efficient of their class.

G. & J. WEIR LTD.
CATHCART · GLASGOW

Designers and manufacturers of:
FEED PUMPS · FEED HEATERS · FEED REGULATORS · OIL FUEL PUMPS · ETC.

VENTILATION *AND* FIRE PROTECTION!

CLOSED
GRAVITY OPENING LOUVRES
FUSIBLE LINK.
STAINLESS STEEL TENSION SPRING, KEEPS LOUVRES CLOSED WHEN NOT IN USE.
LOUVRE OPENING SPRING.
CABLE CONTROL PULLEY FOR NORMAL VENTILATION USE OR FOR TEST OPERATION.

with the COLT DUAL PURPOSE FIRE VENTILATOR

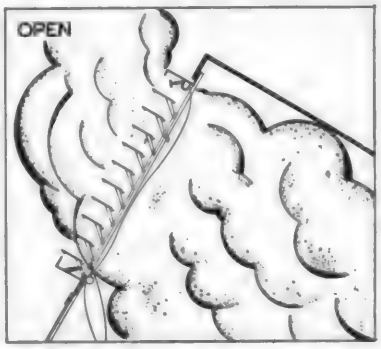
at AC-Delco, Division of General Motors Ltd., Southampton.

A study of industrial fires in Great Britain and in America has shown that the primary cause for the spread of fire is the super-heated air, smoke and explosive gases trapped under the roof. They build up in heat and intensity from the fire below and cause flash fires. Furthermore, the smoke rapidly extends downwards, entirely filling the premises and preventing the work of the fire fighters.

Colt have successfully solved this problem with the design of the Dual Purpose Fire Ventilator which **provides ventilation during normal conditions and—in the event of fire—functions as a heat and smoke exhaust.**

The installation of heat and smoke exhausts is standard practice in America and is rapidly being adopted by leading industrialists in the United Kingdom. Already, 1,290 Colt Dual Purpose Fire Ventilators have been installed in General Motors buildings in this country.

Write to Dept. V.9/8 for paper " Some Aspects of Fire Prevention in Industrial Buildings " by M. J. Reaney, which deals fully with this matter.



The insets illustrate the action of the ventilator as a Heat and Smoke Exhaust. In the event of fire, the fusible link fuses, providing Automatic Escape for Super-Heated Air and Smoke.

COLT VENTILATION

COLT VENTILATION LTD · SURBITON · SURREY

TELEPHONE: ELMBRIDGE 6511 (10 lines)

U.S.A. Subsidiary: Colt Ventilation of America Inc., Los Angeles.

Branches at: Birmingham, Bradford, Bridgend (Glam.), Bristol, Coventry, Dublin, Edinburgh, Glasgow, Liverpool, London, Manchester, Newcastle-upon-Tyne, Sheffield, and Warwick.

Agents in: Australia, Belgian Congo, Canada, Cyprus, India, Indonesia, Madagascar, Malaya, Mauritius, New Zealand, Pakistan, Portugal, North and South Rhodesia, and South Africa.

G579

APEX COMMINUTING MILLS

have many and multiple uses in the

CANNING • FOOD PACKING • BAKING • ESSENTIAL OIL INDUSTRIES

when they are used for:

- Comminution of whole fruit such as oranges, grapefruit, etc., for the manufacture of fruit drinks.
- Disintegration of plants, roots, stalks, etc., prior to distillation to increase the rate of vapourisation and distillation of essential oils and more important to obtain higher yields and better quality oils.
- Disintegration of meats, onions, and many flavouring substances to small particle size with no loss of product and complete utilization of ingredients and flavour.
- High speed chopping and slicing of vegetables for soups, meat sauces and chutney, etc.
- Intimate and perfect mixing of both wet and dry material such as granulated sugar, flour, salt, etc.
- Size reduction of reject boiled sweets and biscuits; the the production of almond and other nut pastes and slurries of fruit and berries for filling flavours.
- Countless other fruit products have been successfully processed.

APEX Comminuting Mills are unique in the field of swing hammer mills; incorporating many special features which include:

★ **FLEXIBILITY OF OPERATION**
★ **HIGH OUTPUT**
★ **UNIFORMITY OF PRODUCT**
★ **NON CORROSIVE CONSTRUCTION**
★ **EASE OF CLEANING AND STERILIZING**
★ **DUSTLESS OPERATION**
★ **TEMPERATURE CONTROL**
★ **INTERLOCKED SAFETY DEVICES**
★ **DUAL BLADE ACTION WITHOUT REVERSING CHAMBER**

Apex Comminuting Mill, No. 114, Type S2. 5 h.p. fitted with underslung motor for process operations where rigid cleanliness and complete absence of any dust pockets is essential.

Over sixty different screens from 1½" opening to 325 mesh — ten different types of dual faced blades and speed variations of 9:1 are available with each model and combine to produce unparalleled flexibility of operation. Special feeding devices include screw feeders up to 6"; rotary valve powder feeders and vibratory feeders.

FIVE MODELS AVAILABLE FROM 3 TO 30 H.P.

Tests willingly made on your own material, write today for details.

APEX CONSTRUCTION LIMITED

SPECIAL PROCESS ENGINEERS

Works: DARTFORD, KENT

15 SOHO SQUARE, LONDON, W.1

Telephone: GERrard 6328/9

Apex Research and Development Division: 11-13 ESSEX ROAD, DARTFORD, KENT
Test Laboratories: DARTFORD, KENT

SAVE YOUR BACON with

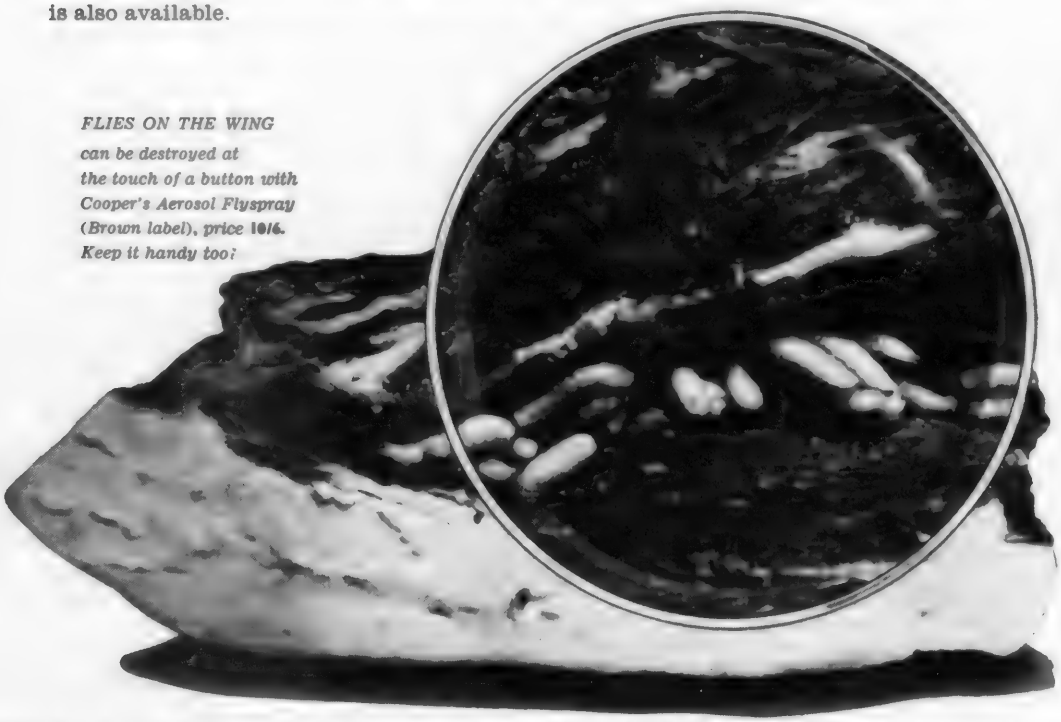
PYBUTHRIN

(REGISTERED TRADE MARK)

BACON PROTECTANT

You can save so much, at so little cost, with " Pybuthrin " Bacon Protectant ! Dusted on sides of bacon and hams, it protects them more effectively against blowflies and similar pests than has ever been possible before. " Pybuthrin " Bacon Protectant contains African pyrethrum synergised with piperonyl butoxide, and is non-poisonous and non-tainting. Leading bacon curers confirm its effectiveness. Write for current prices of puffer-packs, 7-lb. tins and 56-lb. drums. A special Powder Applicator is also available.

FLIES ON THE WING
can be destroyed at
the touch of a button with
Cooper's Aerosol Flyspray
(Brown label), price **10/6.**
Keep it handy too!



● COOPER McDOUGALL & ROBERTSON, LTD BERKHAMSTED · HERTS · EST'D 1843

7/oc/s

DRINGS LTD praise their

SEYDELMANN SUPER CUTTERS!

Read what they have to say

Dear Sirs,

We have now been using Seydelmann chopping machines for about a year and find them reliable and a great advance on the old fashioned low speed hand-emptying machines. They give an excellent and consistent chop in the minimum time and with a very small temperature rise. For most meats they eliminate any requirement for pre-mincing. We have found that one machine operated alternately by two men can do over 150 choppings (each about 110 lbs.) in a working day.

Yours faithfully,

DRINGS LTD., Wembley, Middx.

Other important firms now using Seydelmann Cutters include:—

- CO-OPERATIVE WHOLESALE SOCIETY LTD., LOWESTOFT
- Messrs. JOHN GARDNER LTD., GLASGOW
- ALFRED E. JONES LTD., LIVERPOOL
- Messrs. McGROUTHER LTD., STIRLING
- C. T. HARRIS (CALNE) LTD

STOKES & DALTON LTD., Victoria Spice Mills, Leeds, 9 **Tele: 31701 (10 lines).**

COMMER
enters the 1½ ton field!

WITH CHOICE OF PETROL OR DIESEL ENGINE

NORMAL CONTROL VAN
185 cu. ft. capacity
ALSO AVAILABLE

- *Robust four-speed synchromesh gearbox.*
- *Fully-floating spiral bevel rear axle.*
- *Exceptional visibility and manoeuvrability.*
- *Smooth-ride suspension, hydraulically damped.*
- *Powerful hydraulic brakes, safe and sure.*
- *Superb driver comfort.*

ROOTES PRODUCTS — BUILT STRONGER TO LAST LONGER!

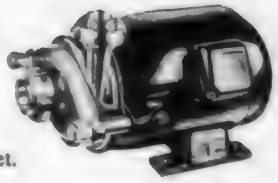
COMMER CARS LTD. LUTON EXPORT DIVISION: ROOTES LIMITED DEVONSHIRE HOUSE PICCADILLY LONDON W.1

When considering PUMPING

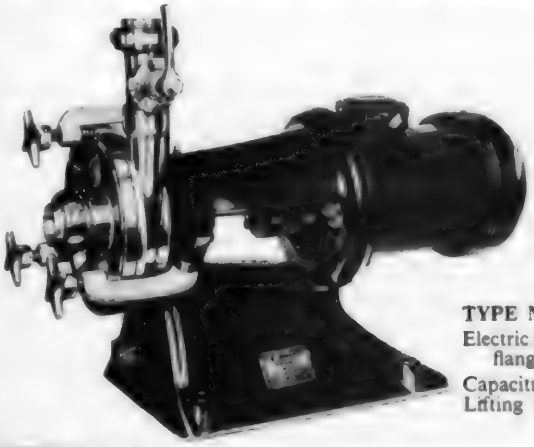
Think of DE LAVAL first!

STAINLESS STEEL CENTRIFUGAL PUMPS

All De Laval Stainless Steel Centrifugal Pumps are of easy clean design—even the impellers are in two halves—a special De Laval feature. Fitted with mechanical seals they are ideal for pumping duties in the food and process industries.

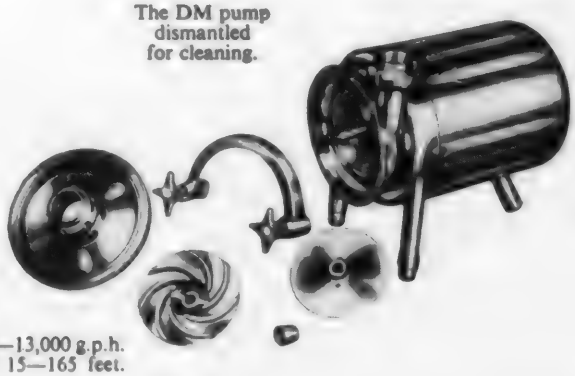


TYPE CM1
All stainless contact
Capacities 1,100—3,300 g.p.h. Lifting head 15-20 feet.



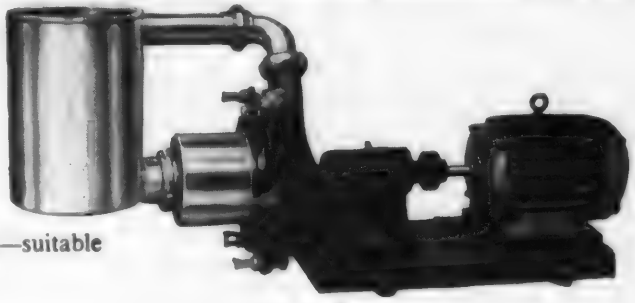
TYPE MZ-155
Electric drive with flange motor
Capacities from 220—13,000 g.p.h.
Lifting heads from 15—165 feet.

The DM pump dismantled for cleaning.



NEW DE LAVAL Defoaming Pump DZ3R

A DUAL DUTY PUMP FOR AERATED LIQUIDS
—SEPARATES AIR
—PUMPS DEAERATED LIQUID



Easily cleaned—all stainless steel construction—suitable for capacities up to 6,500 g.p.h.

Write for full details of the whole range of De Laval stainless steel pumps

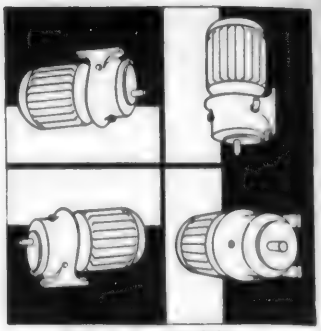
DEPENDABLE DE LAVAL CENTRIFUGAL SPECIALISTS FOR OVER 75 YEARS

Think first of **DE LAVAL** Centrifugal Separators for your separation problem and **DE LAVAL** Heat Exchangers for all heat transfer problems.

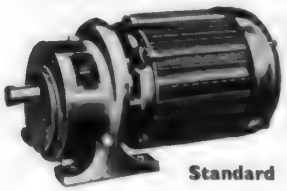
PROCESS ENGINEERING DIVISION: ALFA-LAVAL CO. LTD., GREAT WEST ROAD, BRENTFORD, MIDDX. PHONE EALING 0116

Smee's DL374

the right power
in the right place
at the right speed
WITH CROFTS RITESPEED GEARED MOTORS AND REDUCTION GEARS

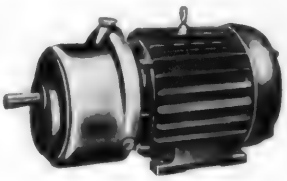


Mounting positions of standard units

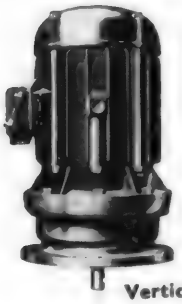


Standard

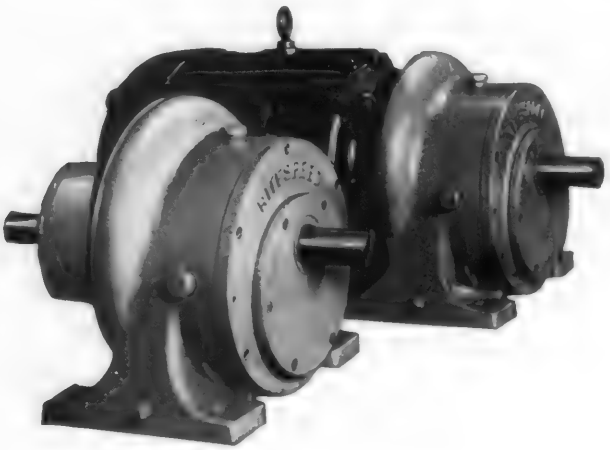
Flange mounting

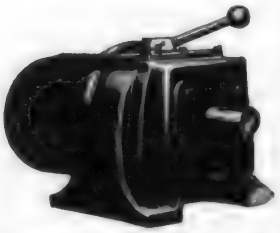


Universal



Vertical





Multi-speed 2, 3 & 4-speed

★ units to fit any make and type of electric motor

★ powers up to 80 h.p.

★ up to 20 h.p. from stock

★ any mounting position

ask for publications 5329 and 5330

for urgent orders from stock, ring
Bradford 65251, Extension 34

Crofts

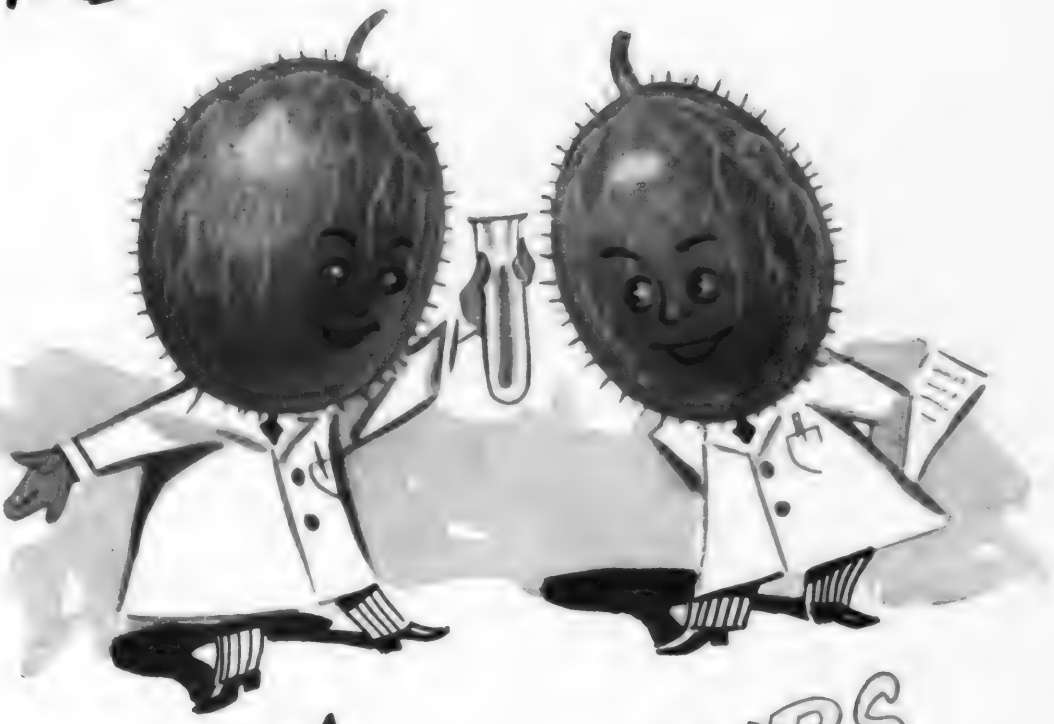
CROFTS (ENGINEERS) LIMITED

BRADFORD 3 ENGLAND

Tel: 65251 (20 *lines*) *Grams:* " *Crofters Bradford Telex* " *Telex* 51-426

BRANCHES AT: Belfast, Birmingham, Bristol, Cardiff, Dublin, Glasgow, Leeds, Liverpool, London, Manchester, Newcastle, Northampton, Nottingham, Sheffield, Stoke

"That's US all right - it must be P&S"



P&S FLAVOURS

are so much better!

POLAK & SCHWARZ (...) LIMITED,
50, Great Cambridge Ro... Middlesex.
Telephone : ENFIEL... ...nes)

—for QUICK deliveries of all

ENGINEERING SUPPLIES

including

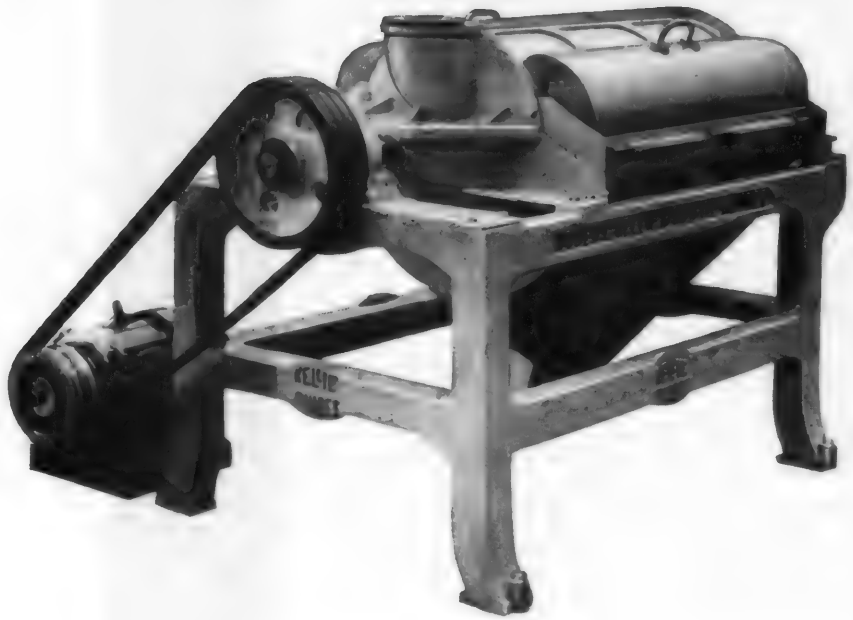
COCKS & VALVES
PACKINGS, JOINTINGS
BELTINGS, VEE-ROPES
OILS & GREASES
HOSES, FITTINGS, etc.

HOP 8022
25 lines

Write or 'phone

W. H. WILLCOX & CO. LTD

SOUTHWARK STREET, LONDON, S.E.1



PULPER

HEAVY DUTY PULPING MACHINE

A sturdy reliable machine with a tremendous capacity, the Kellie Heavy Duty Pulping machine can easily handle up to 20 tons of material per hour. Food products such as tomatoes, apples, prunes, plums, figs, oranges, berries etc. deftly cycloned, sieved and reduced to a liquid or semi-liquid state.
The roughage—skins, seeds, cores and other residue is efficiently strained off. In certain cases where it is necessary to pass the seeds and some chunks into the finished products, this is effectively controlled by fitting a suitable perforated pulping screen.
The Kellie Heavy Duty Pulping machine is capable of dealing with 10 to 20 tons per hour according to the nature of the product. The machine is equally efficient as a rougher or finisher with the use of interchangeable screens.

Send today for full particulars.

KELLIE for FOOD PLANT

ROBERT KELLIE & SON LTD., DUNDEE, SCOTLAND

Telephone: DUNDEE 2819 (2 lines) Telegrams & Cables: "KELLIE" Dundee

MALT PRODUCTS

A THOUGHT FOR FOODS

Protein additions?

Vitamin B complex?

Starch conversion?

Fermentation balance?

Flavour development?

Laboratory media?

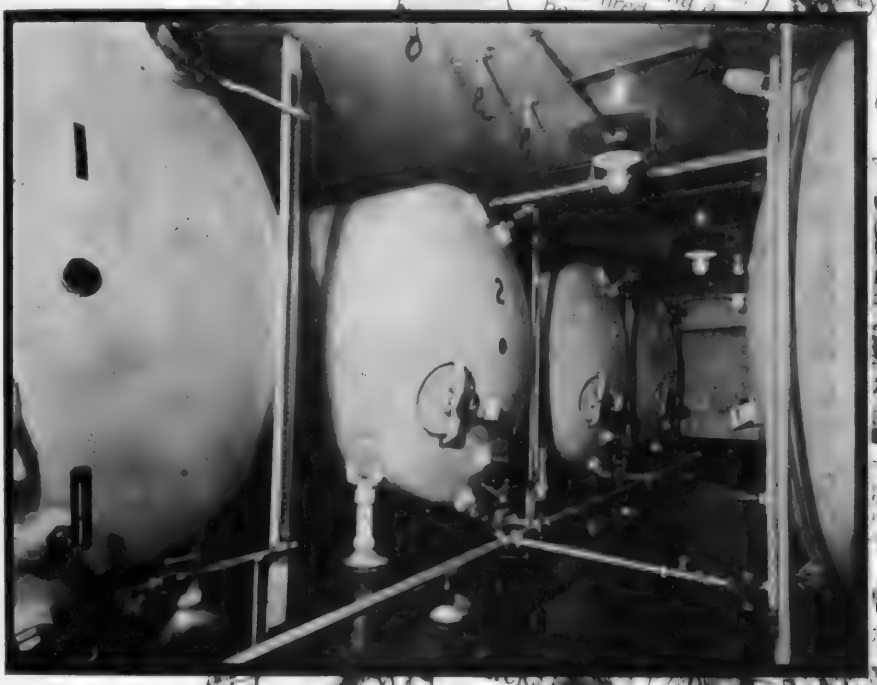
GIVE US FOOD FOR THOUGHT!

MUNTON & FISON LIMITED

EDGARS FACTORY STOWMARKET SUFFOLK

Maltsters for more than a Century

PFAUDLER and HORLICKS



I know - you're going to say that you forgot... that you were tired Well, everybody's getting a little bit tired
AT THE DOCTOR'S
.. a sort of day-to-day tiredness. It goes on and on, even after a long night's sleep
Isn't Daddy full of fun, Mummy! I'm so proud of him
(THINKS) so am I - since he's be taking Horlic
TONIGHT HORLICKS FOR YOU

Horlicks Ltd. of Slough have recently installed a number of Pfaudler glassed-steel storage tanks for the milk used in the manufacture of their well-known beverage. Like so many other well-known food manufacturers, Horlicks Ltd. appreciate the absolute hygiene, cleanliness, and durability of Pfaudler plant. All Pfaudler glassed-steel equipment is covered by one year's guarantee and is backed by an efficient service organization.

GLASSED-STEEL EQUIPMENT

ENAMELLED METAL PRODUCTS CORPORATION (1933) LTD.,
Artillery House, Artillery Row, London, S.W.1., Telephone: ABBey 2188
and DURIE FOUNDRY, LEVEN, FIFE.

EMP 3

ONE OF THE BALFOUR GROUP OF COMPANIES

'Scotch Boy' No. 600 cellulose tape

'SCOTCH' BOY TRADE MARK TAPES

do the job BETTER!

for packaging and sealing

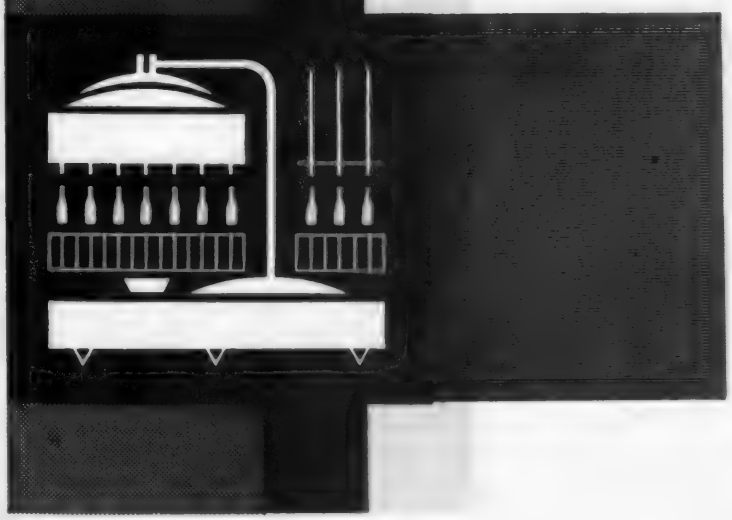
MINNESOTA MINING & MANUFACTURING COMPANY LIMITED
LONDON · BIRMINGHAM · MANCHESTER · GLASGOW

WORLD'S LARGEST MANUFACTURERS OF COATED PRODUCTS

PRODUCT OF 3M RESEARCH

Vantoc AL

a reliable surface-active bactericide, especially suitable for the soft drinks industry



* Economical
* Readily soluble in cold or hot water
* Highly effective against yeasts and a wide range of bacteria
* Penetrates and destroys infection in mixing pans, syrupers, pipe lines, fillers and bottle stoppers.

ICI

Full technical information on request:
Imperial Chemical Industries Ltd
London SW1 England

D.919

QUALITY in White Flint *GLASS CONTAINERS*

First Class in **GLASS**

NATIONAL GLASS WORKS (YORK) LTD.

FISHERGATE YORK Tel YORK 23021
ALSO AT 105 HATTON GARDEN LONDON E.C.1
Tel HOLBORN 2146

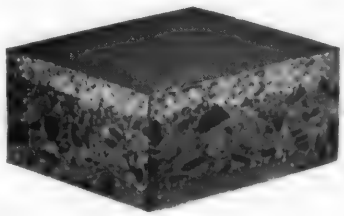
★ Packed in easily handled cartons

PROMPT DELIVERY FROM STOCK

TRADE MARK

Steel clad . . . see!

"You may think that my wearing armour is cheap publicity," our Sales Director was saying, "and you'd be quite right. What cheaper way of ramming home the . . . er . . . bull point* of Stelcon Floors than to hire this steel suit from M . . . . s. Br . . . . s. for a fiver a day, free joint oil included!"



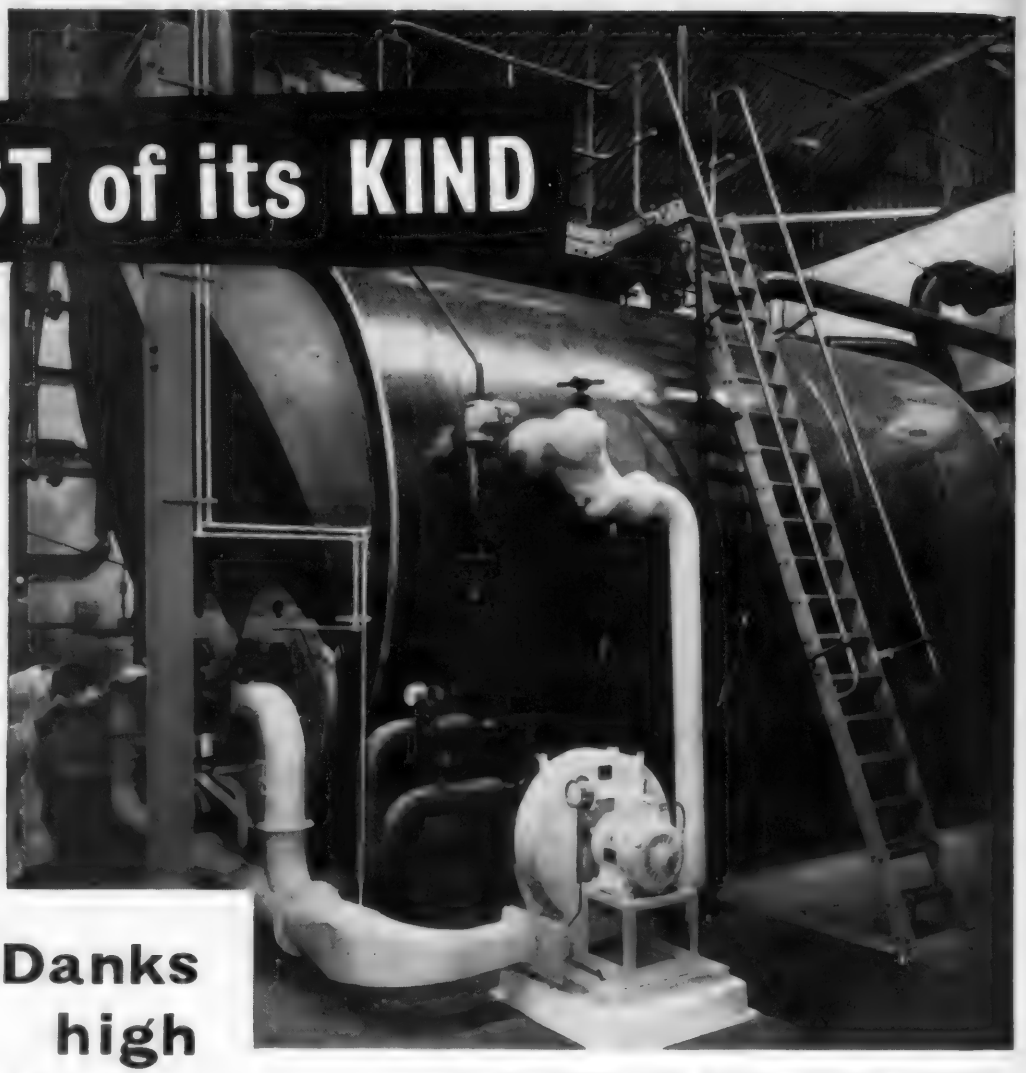
*Stelcon Floors are made in steel plate form or with a top surface of steel chippings in concrete — which means they are exceptionally tough, hard-wearing and free from maintenance bills. They are literally steel clad . . . *see!*

Stelcon ***FLOORS GIVE INDUSTRY A FIRM FOUNDATION***

ANCHOR STEEL PLATES, STEEL CLAD FLAGS AND RAFTS

STELCON (INDUSTRIAL FLOORS) LTD., CLIFFORDS INN, LONDON, E.C.4. TEL: CHAncery 9541

FIRST of its KIND



Edwin Danks high velocity THERMAL STORAGE economic BOILER

At the Quaker Oats Factory, Southall, Middlesex, direct injection cookers, rotary grain driers, and toasting ovens are all served by steam which is also used for the heating of factory and offices. A widely fluctuating steam demand is achieved by the installation of this special oil-fired boiler.

Working at 250 psi pressure, the boiler has a normal output of 15,000 lbs. of steam per hour but can work at a 25% overload rating when necessary. Variations in steam demand are dealt with by the thermal storage of hot feed water which enables the factory load to be evened out and the firing rate kept constant. Substantial fuel economies and increased efficiency are obtained without the use of expensive and bulky accumulators or additional tanks. Designed for coal or oil firing.

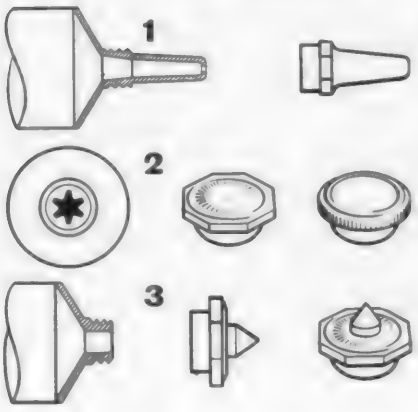
EDWIN DANKS & CO. (OLDBURY) LTD.

OLDBURY, NEAR BIRMINGHAM

TELEPHONE: BROADWELL 1381-6

LONDON · CARDIFF · MANCHESTER · LEEDS · NEWCASTLE · GLASGOW

PUT YOUR FOOD IN TUBES
WITH 'DALE' FEATURES



special nozzles

Customer and consumer demand is catered for in every way. John Dale Limited offer as standard a variety of special nozzles without tool charge for special purposes. Examples are:—

1 The elongated nozzle for piping with icing or jellies.

2 A conventional nozzle with a star shaped orifice for fancy decoration on biscuits, cocktail savouries, cakes, etc.

3 The thin membrane sealed nozzle. This Dale development offers you an Aluminium tube which with its sealed 'Easy-pierce' nozzle is ideally suited to products which must be kept airtight. This nozzle on a tube with one of Dale's special endseals is the perfect pack for any product which is inclined to seep. The nozzle is, of course, easily pierced by means of the spiked cap as illustrated above.

JOHN DALE

'the tube people'

ENTERPRISE 1272
BURY 5295

LIQUID PROCESS CONTROL

buttoned up by

MEASUREMENT

Batch control for a liquid mix nowadays requires precise amounts of several ingredients to be dispensed in exact quantities. To often this job still depends on a man with a bucket and a mind of his own. MEASUREMENT. have replaced this uncertain method with a system of metered control. The quantities are pre-set on a dialled control panel and supplied to the mix, from a remote control point if necessary, at the press of a button Quantities are precise, records are automatic, control is complete and the bucket is out.

meters are matters for

MEASUREMENT

MEASUREMENT LIMITED *(A Member of the Parkinson & Cowan Group)*

Hydraulics Division, 119 Union Street, Oldham, Lancs. Telephone: Main 6432/3/4. Telegrams: Supermeter, Dobcross.

EXPORT ENQUIRIES TO: Parkinson & Cowan Group Exports Ltd.,

Terminal House, Grosvenor Gardens, London, S.W.1. Telephone: Sloane 0111/4. Cables: DISC, London.

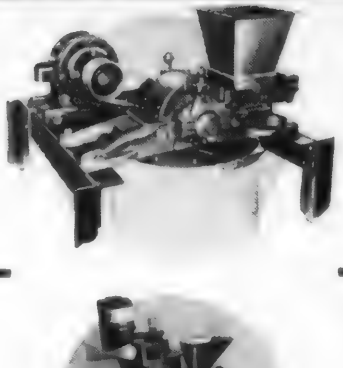
ENSURE PERFECT GRINDING AND BLENDING

OF YOUR MATERIALS . . . .

with

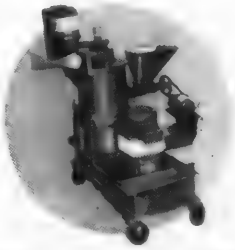
MIKRO EQUIPMENT

The **MIKRO-PULVERISER**



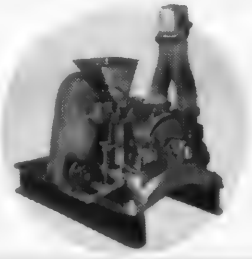
A high speed mechanical pulveriser offering a wide range of particle sizing, granular to fine grind (10—300 mesh) safe and economical for both wet and dry grinding.
Available in six sizes with capacities from 10—10,000 lbs. per hour.

The **MIKRO-BUD**



A new vertical hammer mill with built in air classifier for the reduction of solids to within the 80—10 micron range. Particle sizing can be changed in seconds while the machine is in operation.
10°F. maximum temperature rise.
Available in two sizes giving 35/70 lbs. per hp/hour.

The **MIKRO ATOMISER**



A mechanical, screenless mill for the production of smooth, ultra-fine powders in the lower micron range (25—1 microns). Compact and highly efficient.
Available in three sizes with capacities from 5—5,000 lbs. per hour.

100% dustless operation can be achieved by connecting any of the above machines to one of our MIKRO FIL UNITS

Free test laboratory service with demonstrations at Bristol and Cologne, Germany

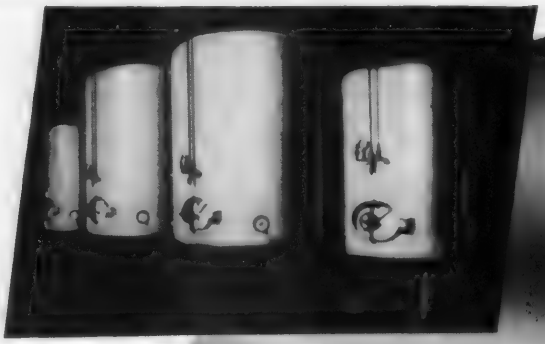
BRAMIGK & COMPANY LTD

MIKRO HOUSE · 15 CREECHURCH LANE · LONDON · E.C.3 Telephone: AVEnue 4822-5

Exclusive Manufacturing Licencees for Pulverising Division, Metals Disintegrating Company Inc., Summit, New Jersey, U.S.A.

3,000 gallon stainless steel storage vessel.

Sheet Metal Fabrication of all kinds



Range of four Guinness storage vessels.

Experts in the fabrication

of stainless steel, mild

steel, Monel, copper,

aluminium, etc., up to $\frac{3}{8}$" plate

Stainless steel vessel under construction at the Brentford Works of Metaducts Ltd.

METADUCTS LIMITED

CATHERINE WHEEL ROAD BRENTFORD TELEPHONE EALing 3678

NORTH-WEST AREA OFFICE: QUEEN'S HALL BUILDINGS, MARKET STREET, WIGAN

3492

For Product Safety use

KORK-N-SEAL

MOULDED & METAL CLOSURES

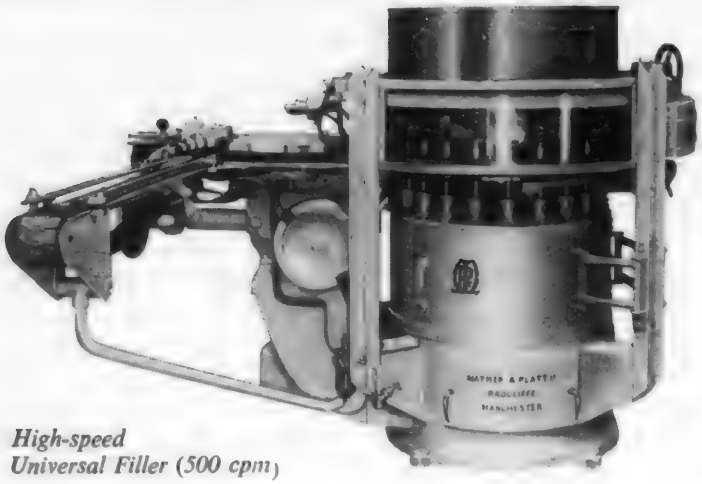
WITH UGB GLASS CONTAINERS

KORK-N-SEAL LTD

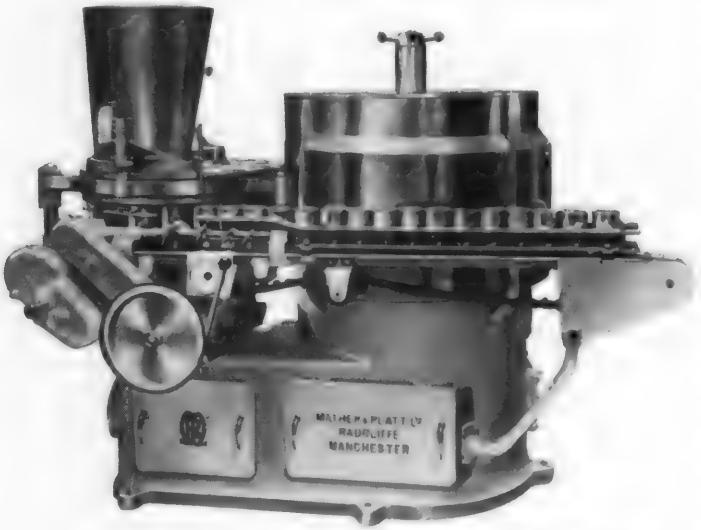
UGB CLOSURE DIVISION

The Closure Division of The United Glass Bottle Manufacturers Ltd

Head Office: 8 LEICESTER STREET, LONDON, W.C.2 Tel: GERRARD 8611 (23 lines) Grams: KORKANSEAL, LESQUARE, LONDON



High-speed Universal Filler (500 cpm)



High-speed Solid and Liquid Filler (300 cpm)

A10 Can Filler (30 cpm)

MODERN FILLING MACHINERY

These modern machines are part of a new and complete range of designs by Mather & Platt Ltd for the canning industry. They combine a high degree of accuracy with high speed and simple and economical maintenance.

Mather & Platt
LIMITED

RADCLIFFE
MANCHESTER

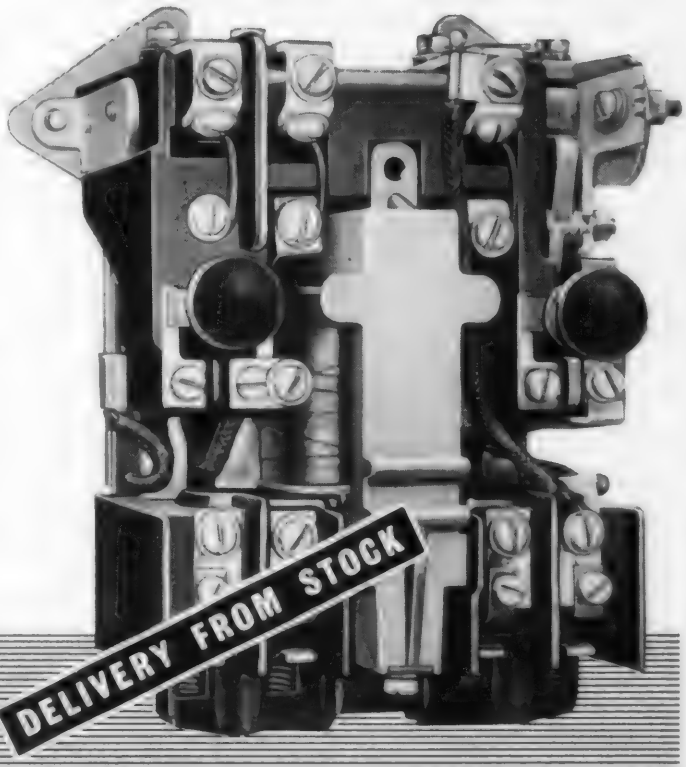
606

A.C. Direct-on-line
CONTACTOR STARTER

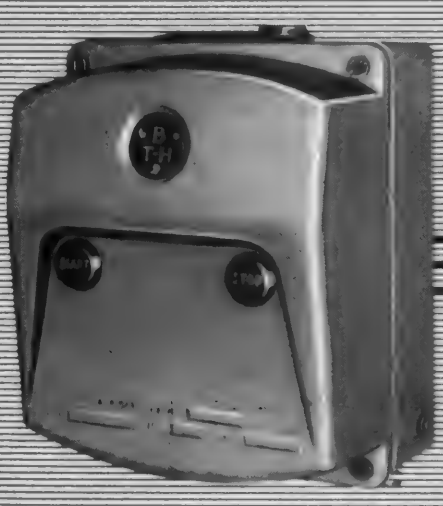
Type DOC 71 for three-phase or single-phase non-reversing squirrel-cage induction motors.

This starter is sturdy in construction, elegant in appearance, and dependable in operation. It is available for motors up to 5 horsepower, and complies with BS. 587.1957 for "Frequent Duty", i.e. forty starts per hour.

The starter, comprising a triple-pole contactor with normally-open auxiliary switch and triple-pole hand-reset thermal overload relay, is enclosed in a distinctive die-cast aluminium case with integral START-STOP push buttons.



DELIVERY FROM STOCK



Up to 5 h.p.

200-550 volts

25-60 cycles

BRITISH THOMSON-HOUSTON

THE BRITISH THOMSON-HOUSTON COMPANY LIMITED · RUGBY · ENGLAND

an A.E.I. Company.

A5156

fmi
FABBRICA MACCHINE INDUSTRIALI NAPOLI

fabbrica macchine industriali

via e. gianturco. 31 - napoli

30 years experience in the construction of can making machines

SLITTERS

FLEXERS

BODYMAKERS

SOLDERING MACHINES

FLANGERS

DOUBLE SEAMERS

TESTERS

SCROLL SHEARS

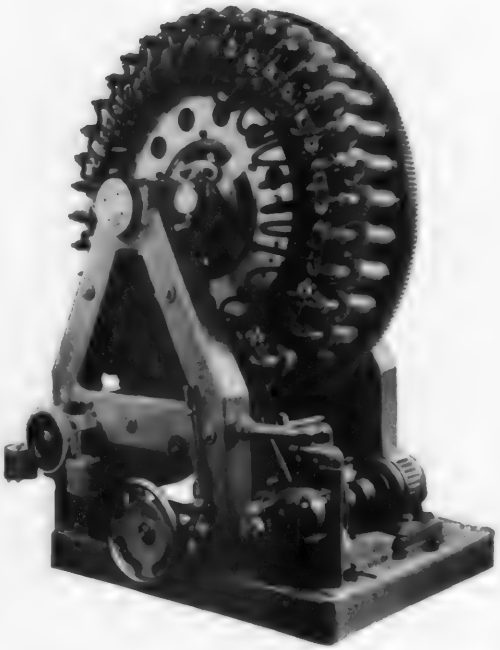
PRESSES

CURLERS

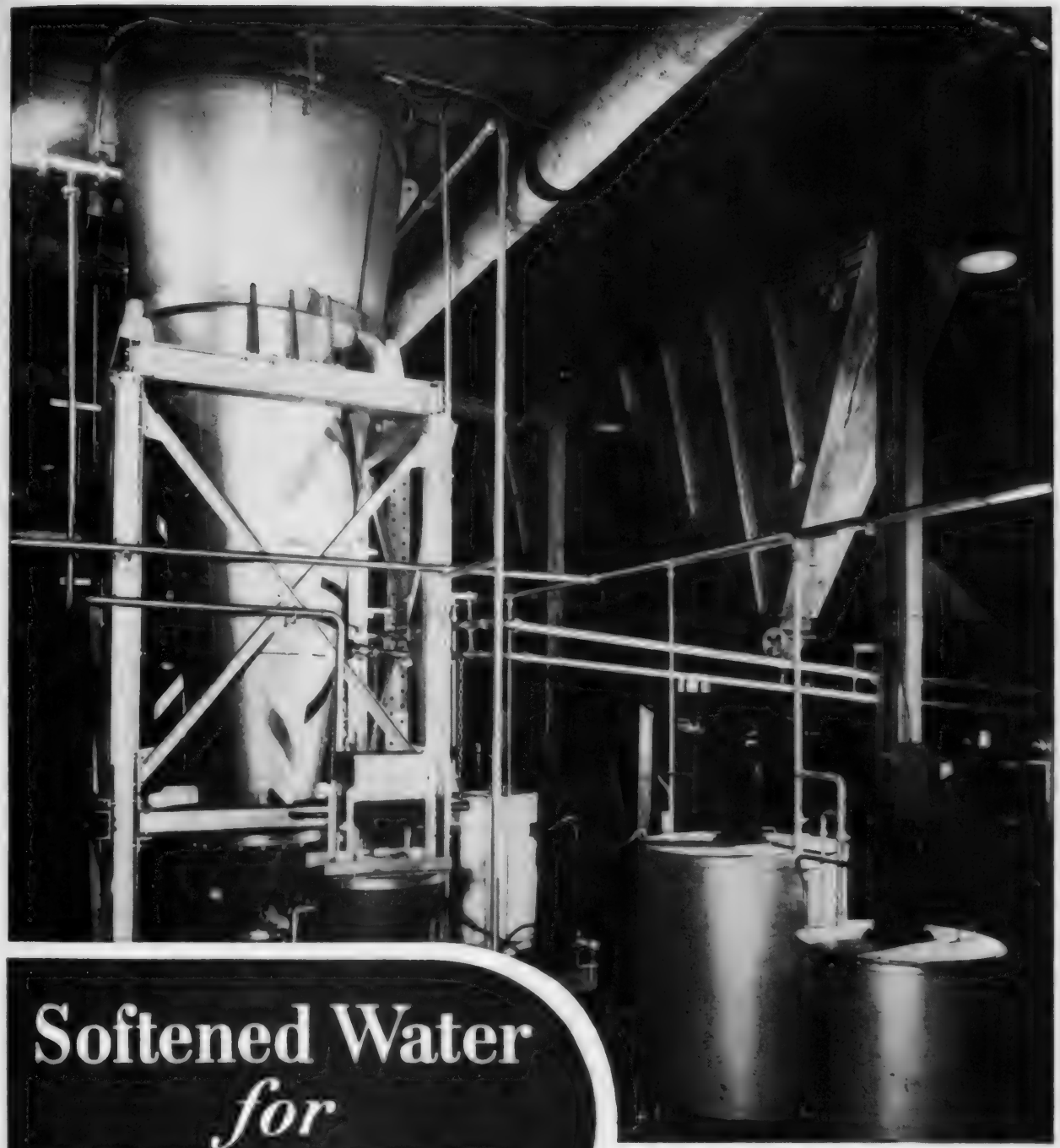
LINING MACHINES

DRYING OVENS

FILLING MACHINES



Automatic CAN tester, model 1173
Cans admitted: 100—1200 grs.
Output: 300 cans per minute



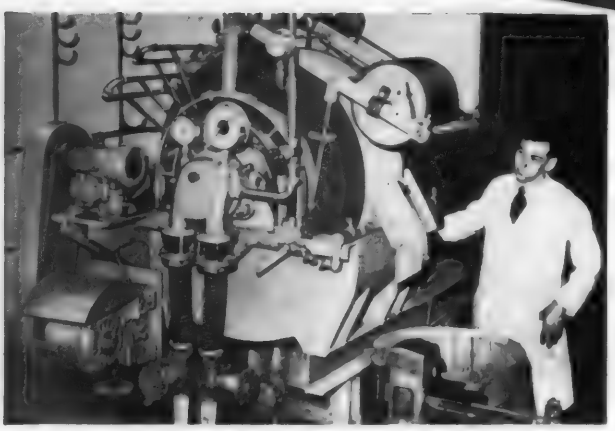
Softened Water *for* BOILER FEED by PERMUTIT

Consistent Zero-hard softened water for boiler feed is supplied by this Spiractor and Ion Exchange Water Treatment Plant. This is only one of a range of Permutit plant designed to supply correctly treated boiler feed. If you require further information on Permutit boiler feed water treatment plant, please write to:—

The PERMUTIT COMPANY LTD. Dept. W.L. 272, Permutit House, Gunnersbury Avenue, London, W.4

Telephone: CHIswick 6431

INVITATION



FOR those who wish to carry out large scale filtration trials — on their own premises under actual working conditions — a complete Paxman Filter pilot plant can be made available.

The unit has a filter area of 10 sq. ft. and embodies its own vacuum pump and other ancillaries all mounted on a common base-plate.

Where bulk samples are available, filtration tests can be carried out at our own works on a filter test plant. This latter service is entirely free of charge and clients are invited to be present.

DAVEY, PAXMAN & CO. LTD.

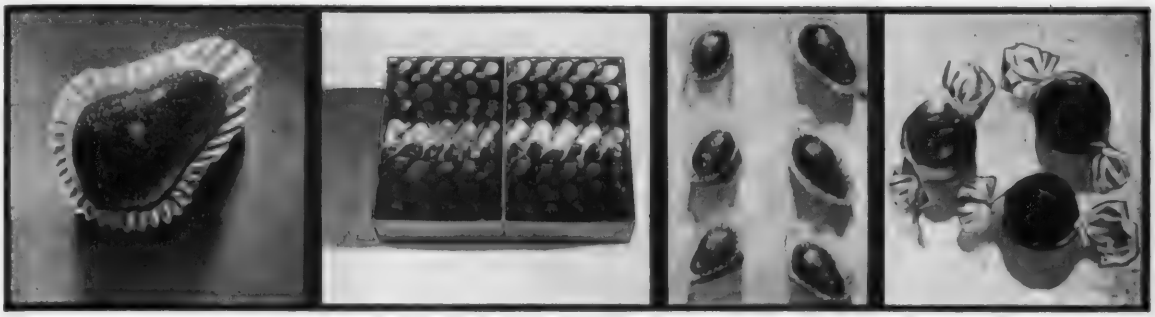
COLCHESTER · ENGLAND

Telephone: Colchester 5151 · Telegrams: Paxman, Colchester · Telex: 27-2678

Paxman

ALSO MAKERS OF DIESEL ENGINES, BOILERS AND HEAVY FABRICATED METALWORK

F.73



'Globe' glucose for confectioners

With acknowledgments to Taverner and Sons Ltd.

'Globe' liquid glucose, 'Cerelose' powdered glucose, and the wide range of other starch products made by Brown & Polson Limited for confectioners, are the best of their kind—and they are backed by a unique service of technical advice to confectionery manufacturers.

GLOBE brand
LIQUID GLUCOSE

CERELOSE brand
POWDERED GLUCOSE

AND A FULL RANGE OF
CONFECTIONERS' STARCHES

Brown & Polson Ltd

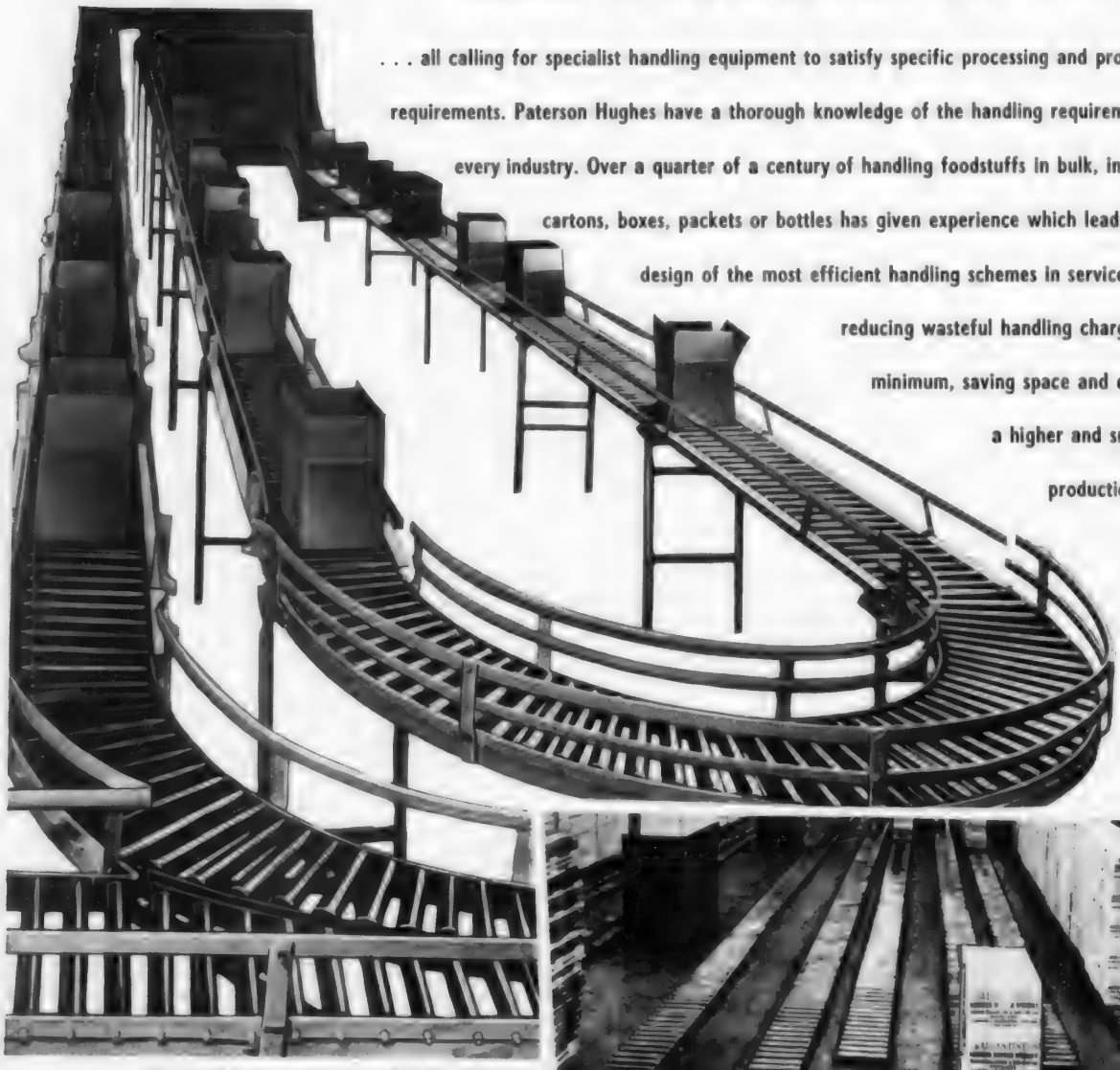
INDUSTRIAL PRODUCTS DIVISION

Unchallenged Leaders of B&P Britain's Starch Industry

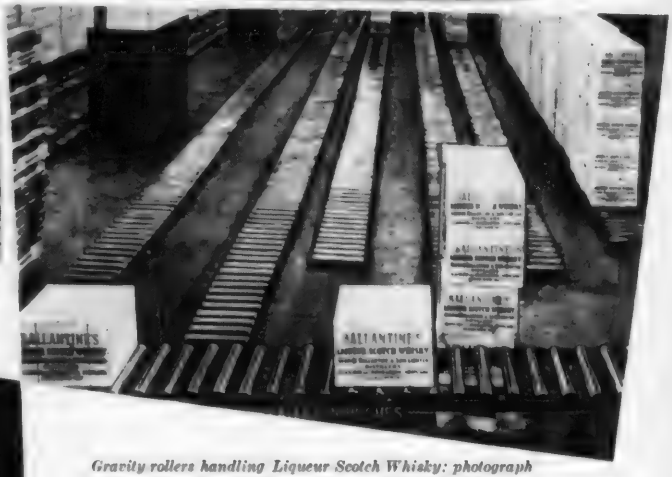
WALLINGTON HOUSE, 125-130 STRAND, LONDON, W.C.2

There are Foodstuffs and Foodstuffs....

. . . all calling for specialist handling equipment to satisfy specific processing and production requirements. Paterson Hughes have a thorough knowledge of the handling requirements of every industry. Over a quarter of a century of handling foodstuffs in bulk, in crates, cartons, boxes, packets or bottles has given experience which leads to the design of the most efficient handling schemes in service today, reducing wasteful handling charges to a minimum, saving space and ensuring a higher and smoother production flow.



Photograph by kind permission of Rowallan Creamery Ltd., showing Gravity Roller handling Margarine



Gravity rollers handling Liqueur Scotch Whisky: photograph by kind permission of George Ballantine and Son Limited

PATERSON HUGHES
ENGINEERING COMPANY LIMITED

MECHANICAL HANDLING ENGINEERS AND CRANE MAKERS

WYNDFORD WORKS MARYHILL GLASGOW
TEL: MARYHILL 2172-4
BEDFORD HOUSE BEDFORD STREET LONDON WC2
TEL: TEMPLE BAR 7274-6
3 HIGHFIELD ROAD EDGBASTON BIRMINGHAM
TEL: EDGBASTON 2957-8
8 CHATHAM STREET PICCADILLY MANCHESTER
TEL: CENTRAL 6623
PATERSON HUGHES ENGINEERING SA (PTY) LTD
P.O. BOX 811, JOHANNESBURG

P4330

Hands Off!

No handling, no bags,
with this new method of buying
PURE DRIED VACUUM SALT

Here's the swiftest, cleanest, cheapest method of delivering Pure Dried Vacuum Salt. I.C.I's new air-discharge vehicles deliver the salt in bulk straight from our factory to yours. The salt is pumped automatically into your silo or saturator—there's no manhandling, no sacks and no risk of contamination. Think of the saving in cost!

Send now for our free booklet 'Streamlined'—it gives full details of this new, time-and money-saving service.

IMPERIAL CHEMICAL INDUSTRIES LTD.,
LONDON, S.W.1.

ICI

B.2.65 A

use 'Darvic' for panels, facings and complete interiors

'Darvic' p.v.c. sheet used to face refrigerated display cabinet made by The Bedford Refrigeration Co., Ltd.

'Darvic' p.v.c. sheet being stuck to the frame of a refrigerated cabinet made by The Bedford Refrigeration Co., Ltd.

'DARVIC'

'Darvic' is the registered trade mark for the rigid p.v.c. sheet made by I.C.I.

'DARVIC' P.V.C. SHEET is a tough, rigid plastic material, with high impact strength and rigidity even in thin sheets. It resists corrosion, is non-inflammable, odourless, and is suitable for food or drink containers.

'Darvic' is ideal for refrigerator door panels and facings. It is also used, in one-piece shapings, for complete interiors. It has great advantages over conventional materials because of its high impact strength and resistance to corrosion. Because of its low thermal conductivity, 'Darvic' breaker strips can be incorporated as an integral part of the liner. This eliminates the cost of separate breaker strips and facilitates attachment of the liner. Crisper trays and freezer trays are easily moulded from 'Darvic' sheet.

'Darvic' is sold in a wide range of colours and multi-colour laminates.

IMPERIAL CHEMICAL INDUSTRIES LIMITED · LONDON · S.W.1

PD.17/1

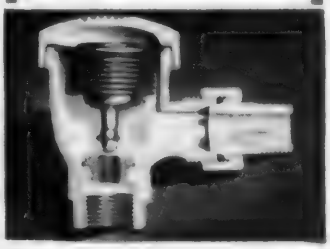
ICI

". . . they were in trouble with these presses as they were unable to obtain desired results with the processing of plywood for aircraft propellors. We found the presses were being group trapped by a — — trap. Water-logging was taking place resulting in a low surface temperature on the platens. We recommended that each platen should be fitted with a Drayton/Armstrong HOO trap. They have really been delighted with the results as water-logging has been eliminated and entirely satisfactory results are being obtained."

"The story behind this trap installation is quite interesting"

Drayton-Armstrongs draining a Siempelkamp press at A. Harvey Ltd., Maidenhead.

The 'Drico'
Balanced Pressure Trap



The Thermostatic trap with a bellows element guaranteed for 2 years and up to 75 lbs./sq. in. Low in first cost, compact, completely reliable. For radiators, steam coils, heaters, canteen appliances, etc. Available ex-stock, angle and straight-way, ½" and ¾" sizes.

Here you see the advantages of "unit trapping" and of using Drayton-Armstrongs for the purpose. No two steam coils or chambers will condense steam at exactly the same rate. There is a greater pressure drop in the units that condense the fastest: steam will back flow from a higher to a lower pressure unit. This blocks off flow of air and retards condensate flow from the lower pressure unit. Hence the water-logging.

Drayton-Armstrongs are the most efficient steam traps for the job. . . . With their high leverage they can handle more condensate than any other trapping system size for size. For higher temperatures, lower processing costs and the longest trouble-free service, *fit each unit with a Drayton-Armstrong.*

DA 51

DRAYTON Steam Traps

DRAYTON REGULATOR & INSTRUMENT CO. LTD., WEST DRAYTON, MIDDX. *Tel. West Drayton 4012*

PACK

TRANSPARENT CELLULOSE WRAPPING

WITH

CLEAR & TINTED · PLAIN & PRINTED

SIDAC

TYPES & GAUGES FOR EVERY PURPOSE

The hygienic wrapping which protects food products and adds to their sales appeal. It is the logical choice for most products sold in self-service shops.

BRITISH SIDAC LTD

ST. HELENS · LANCASHIRE · *St. Helens 4041*

LONDON SALES OFFICE & WAREHOUSE
12 UFTON RD · LONDON N.1 · *Clissold 6404*

StaffordAllenS Vanilla Extracts are pure extractives of the finest beans. For the true flavour of natural vanilla they are unsurpassed.

Samples will gladly be sent on request.

STAFFORD ALLEN & SONS LTD., WHARF ROAD, LONDON, N.1

'Phone: CLErkenwell 1000 (7 lines)

Telegrams: Stafalens, Nordo, London

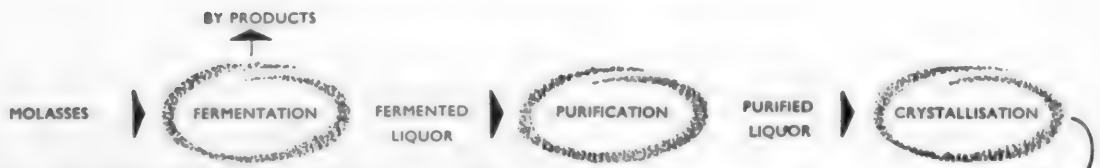
TAS/AL 589

FINE CITRIC ACID IN THE MAKING

Running a Temperature

No use telling our new artist that pictures are a primitive form of expression which gave way to symbols, alphabets and written language. Just mention a phrase and he makes a visual interpretation of it — usually the wrong one. The high temperature we had in mind gives no cause for alarm, but it is in fact essential at a certain stage in the production of Sturge citric acid. It occurs when spores of Aspergillus Niger are sown in molasses.

As the spores feed on the raw material and form a mould, considerable heat is generated. After several days, when the conversion to acid is complete, the solution undergoes several stages of refining before emerging as the pure citric acid for which Sturge is famous throughout the world.



Manufacturers of fine chemicals since 1823

STURGE

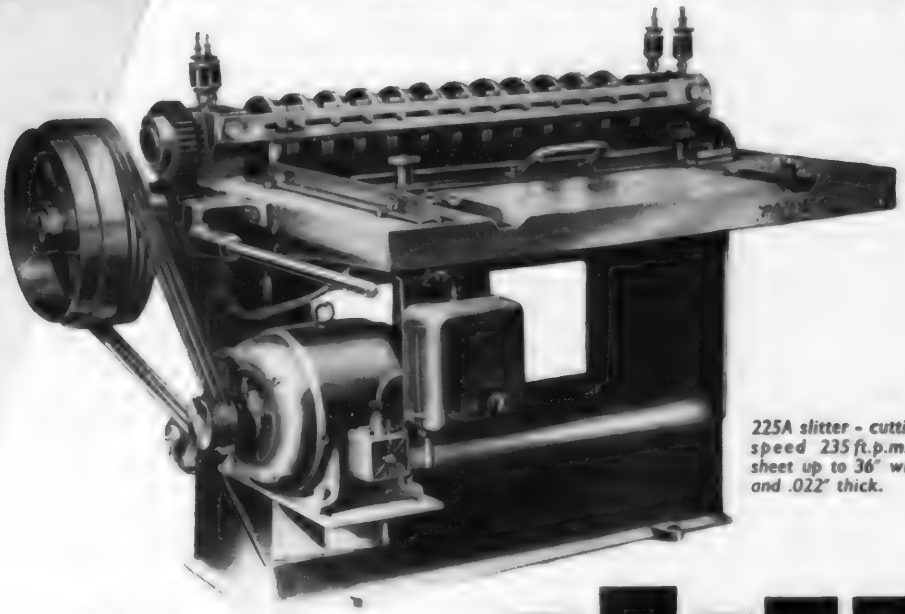
CITRIC ACID BP

CITRIC ACID ANHYDROUS

JOHN & E. STURGE LTD · WHEELEYS ROAD · BIRMINGHAM, 15 · TEL: MIDLAND 1236

TGA CAP

Wherever sheet is cut-



225A slitter - cutting speed 235 ft.p.m. - sheet up to 36" wide and .022" thick.

there's need for gang slitters by BLISS

325C slitter - cutting speed 200 ft.p.m. - sheet up to 42" wide and .036" thick.

Bliss gang-slitters are built to slit straight, fast, and true and to give yeoman service throughout the years.

Bliss gang-slitters are rotary type machines with solid one piece bearings, heavy frames and end thrust bearings. The cutters will shear on either edge and a grinding attachment which sharpens the cutters in position is available, as are a variety of special gauges.

If you want accurate, dependable slitter production - you can't buy better than BLISS.

BLISS
SINCE 1857

E. W. BLISS (ENGLAND) LTD · CITY ROAD · DERBY

Telephone: Derby 45801 (4 lines)

LONDON OFFICE:-

2/3, The Sanctuary, Westminster, S.W.1. Tel: Abbey 3651 (2 lines)

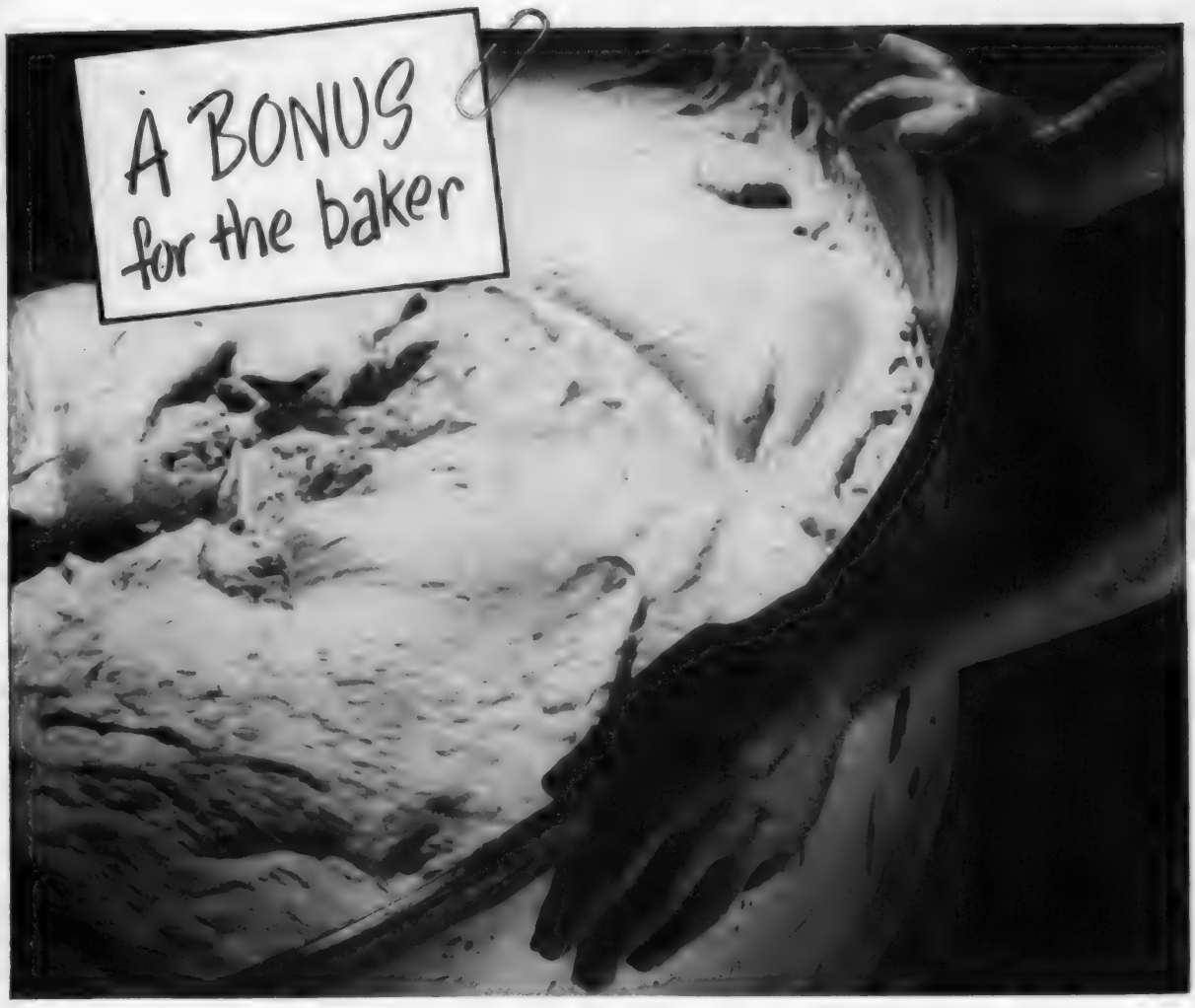
Presented with pride!

Seal your pack with "Viskrings" and establish confidence between you and your consumer. YOU can be confident that your bottling will reach the consumer perfect and intact. The CONSUMER will be confident that the contents are genuine and as expected—a fine product, perfectly presented. Seal all stoppered and screw-capped bottles with "Viskrings". There is a "Viskring" to fit every bottle neck, available in a wide range of colours. "Viskrings" can be printed with your brand symbol. Send your container complete with primary closure to us for fitting. We will return it with samples and quotations for any quantity.

- "Viskring can be applied rapidly by hand—no machinery is necessary.
- They are self-adjusting.
- They prevent the blowing or riding of stoppers.
- They prevent the movement of screw caps once they are tightened.
- They afford protection for branded products and reduce pilferage and evaporation.
- CELLULOSE CLOSURES . . . Contain No Metal . . . Require No Adhesive.

for your Sales sake fit "Viskrings"

THE VISCOSE DEVELOPMENT CO. LTD.
40 CHANCERY LANE, LONDON, W.C.2 Telephone: CHAncery 8111 Telegrams: Viskap, Westcent, London. VC/4



FOUR MORE BOWLS A WEEK

—without increasing the flour order

The baker with Simon bulk flour handling and storage looks with satisfaction at the contents of his dough bowls. Every week he saves large quantities of flour that were once lost in the fibres of sacks and on bakery floors. It has been calculated that a bakery with the new system using 250 tons of flour in a week will gain four extra dough bowls of flour every seven days—four bowlfuls that were previously lost in an inefficient sack plant. The Simon system stops waste, puts up your profits. If you would like more flour in your dough bowls—without increasing your flour orders—get in touch with us now.

SIMON
BULK HANDLING AND STORAGE

Henry Simon Limited
CHEADLE HEATH · STOCKPORT

HS.292/PS

Pack it in

GLASS . . . for Self Service

AND ALWAYS USE GOOD BOTTLES

UNITED GLASS BOTTLE MANUFACTURERS LIMITED

8 LEICESTER STREET, LONDON, W.C.2

Telephone: GERRARD 8611 (23 Lines) *Telegrams:* UNGLABOMAN, LESQUARE, LONDON

GOOD LIFT

- the secret of Fine Puff Pastry

The choice of fat. HIGH-QUALITY puff pastry should have good lift, together with even layer formation, and a regular shape. The choice of fat for puff pastry is of great importance. A suitable fat must have these qualities:

1. It must stand up to production techniques.
2. Have good plasticity at normal working temperature and not penetrate the dough layers.
3. Maintain unbroken layer formation throughout operations, and so ensure good lift.
4. Confer 'built-in' qualities, such as richness and a good flavour background, to produce crisp, dry-eating pastry with a bright, appetising appearance.

Here's the answer. CBC's quality margarines, such as Dolphin, because of their consistency and plasticity, stand up to the widest range of production techniques—including fully automatic machine production. There is no breaking down. The dough layers are separated effectively by even, unbroken layers of Dolphin, and with, say, six half turns there are actually 1,458 layers of Dolphin separating 1,459 even layers of dough. This ensures good volume and light flaky pastry with a rich flake and a good 'bloom'.

Wide CBC range. But Dolphin and the other CBC margarines are just one section of the wide CBC range of margarines and shortenings. As long-established specialists, CBC are well versed in all aspects of baking. This wide experience is at your disposal. The Sales Director will be happy to hear from you at any time. Just 'phone CITy 6783 or write him at the address below.

***Whatever you produce*—a CBC quality fat exists to meet your needs**

Get your Fats and your Facts from CBC

CRAIGMILLAR & BRITISH CREAMERIES LIMITED, SUSSEX HOUSE, QUEEN STREET, LONDON, E.C.4 • Telephone: CITy 6783

CCT 69-5-130

Two heads are better than one . . . so send that flavouring problem to the

BOEHM EXPERIMENTAL KITCHEN

As acknowledged experts in the field of food flavouring it is possible that we have the answer to your immediate flavouring problem. If not, the Boehm Experimental Kitchen will get to grips with it and do its best to find a solution. This service is absolutely free and, needless to add, is becoming more and more popular with manufacturers. Incidentally, many products today owe a great deal to the shrewd advice and technical help of Fredk. Boehm Ltd. Why not put your problem in the post to them NOW?

FREDK. BOEHM LTD.,
CONTINUES TO SUPPLY

AJI-NO-MOTO
Mono-sodium glutamate 99% pure.

YEATEX
Autolysed Yeast Extract.

PROTEX
Hydrolised Protein.

FREDK. BOEHM LTD., 19 BENTINCK STREET, W.1 Telephone WELbeck 7933

CUSTOM MADE
FISHER'S
ALUMINIUM
FOILS
FOR PERFECT PACKAGING
FISHER'S FOILS LIMITED, EXHIBITION GROUNDS, WEMBLEY, MIDDLESEX, ENGLAND
Tel: Wembley 6011
Cables and Grams: Liafoil, Wembley (A.B.C. Code 6th Edition)
M+W.106

Inferior Flavours will not be improved by Colours

BUT

Colours enhance Good Flavours

Can we help you?

We have been suppliers of Foodstuffs Colours for over 60 years.

All colours supplied to conform to the latest regulations.

THE CONFECTIONERS' VEGETABLE COLOURS & FRUIT ESSENCES LTD

MESSINA WORKS, 43a WHITE POST LANE, LONDON, E.9 • *Telephone:* Amherst 2274

GLASS ENAMEL LINED EQUIPMENT

★

A Complete Plant or a Single Unit. Designed to meet your own requirements, and lined with a Hard Glass Enamel developed during over a century of service to the chemical industry.

★

T. & C. CLARK & Co., LTD.

WOLVERHAMPTON

Established 1793

Grams: Clark, Wolverhampton

Telephone: 20204/5

A case for everything and everything in its case ...

Call in the REED SERVICE

IF YOU have a packaging problem we can certainly help you. Pioneers in corrugated fibreboard cases, Reed offer a unique packaging service.

EIGHT-FACTORY NETWORK. Reed production facilities embrace eight factories 'on permanent call'. This means that any order can be carried out promptly and efficiently, at competitive prices, in any part of the country.
Our Representative is backed by the greatest organisation of its kind in the U.K.

Reed Packaging Service to Industry

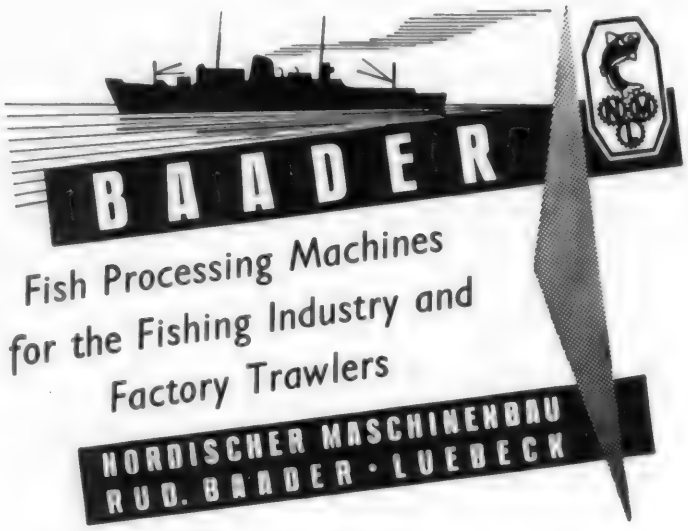
REED CORRUGATED CASES LIMITED

GREAT WEST ROAD · BRENTFORD · MIDDLESEX

Tel: EALing 4555

BIRMINGHAM · CAMBRIDGE · EDINBURGH · MANCHESTER · NEW HYTHE (Maidstone)
TOVIL (Maidstone) · WARRENPOINT (Northern Ireland)

Reed



★ THE NEW JOHN HUNT
POWER PASTRY ROLLER

SPECIALLY DESIGNED TO FILL A LONG FELT NEED FOR A MEDIUM SIZED POWER ROLLER CAPABLE OF HANDLING LARGE QUANTITIES OF PASTRY AND YET NOT SO WASTEFUL OF SPACE TO MAKE IT IMPRACTICAL FOR THE AVERAGE USER

- COMPACT DESIGN
- ROBUST CONSTRUCTION
- FULLY GUARANTEED

We also manufacture a **HAND-OPERATED PASTRY ROLLER.** A boon to those with limited space, the hand-operated roller can be operated by a young person without fatigue. Sturdily constructed yet not too heavy to move about when required.

PLEASE WRITE FOR DESCRIPTIVE LITERATURE

The John Hunt range of equipment includes "Little Champion" Pie & Tart Machines, "Duratax" Cake Mixers, Dough Mixers, Electric Potato Peelers etc.

FULL DETAILS SENT ON REQUEST

THOUSANDS OF 'JOHN HUNT' MACHINES IN ✱ OPERATION THROUGHOUT GREAT BRITAIN & OVERSEAS.

JOHN HUNT (Bolton) LTD. ALMA WORKS · RASBOTTOM ST. BOLTON · Tel. 5831 Bolton

Contact Sanders

tube packaging experts to solve your food packaging problems

Have you a food product—old or new—in need of an attractive, novel, *different* pack to stimulate sales? You may well find a collapsible tube the perfect answer. Why not talk to our Technical Division about it? Their advice is available freely and without obligation, and they will willingly work with you in developing the most suitable type and design for your product.

PACK IT IN A TUBE FOR ECONOMY

There's no wastage with a collapsible tube. Only the required quantity of contents is squeezed out. The remainder will be preserved almost indefinitely. It's ideal for mustard, mayonnaise, ketchups and purées.

SATURN

SANDERS

SANDERS FOR PACKMANSHIP *(Our 131st year)*

COLLAPSIBLE TUBES · RIGID METAL CONTAINERS · SPECIAL PACKS
BOTTLE CLOSURES · SPRINKLERS · PRESSINGS AND COMPONENTS

H. G. SANDERS & SON LTD., Saturn Works, Gordon Road, Southall, Middlesex. Tel: SOUthall 5611

Sixteen Books in One

FOOD INDUSTRIES MANUAL

A Technical and Commercial Compendium on the Manufacture, Preserving, Packing and Storage of all Food Products

1. FLOUR AND FLOUR MILLING. 2. BREAD-MAKING AND CONFECTIONERY. 3. SUGAR CONFECTIONERY, CHOCOLATE, JAMS, JELLIES. 4. CANNING AND PRESERVING. 5. MEAT PRODUCTS. 6. PICKLES & SAUCES. 7. THE DAIRY INDUSTRY. 8. FOOD DEHYDRATION. 9. EDIBLE FATS & FATTY FOODS. 10. FRUIT JUICE PRODUCTS. 11. FOOD STORAGE & REFRIGERATION. 12. FOOD HANDLING EQUIPMENT. 13. PACKAGING. 14. THE BOILER HOUSE. 15. COMPOSITION OF FOODS. 16. VITAMINS IN FOODS. INDEXES. SUBJECT INDEX. BUYERS' GUIDE

18th edition. Demy 8vo. xl + 1026 pages. Illustrated. 65s. net, postage; 2s. Inland. 2s. Abroad.

The eighteenth edition of *Food Industries Manual* is the key to all available and up-to-date information in every branch of Food Industry.

Written by men with academic qualifications and industrial experience, this authoritative encyclopaedia contains more information than any other food publication in the world.

Alphabetically arranged to facilitate use, it gives all the facts, data, tables, formulae, descriptions, recipes, illustrations and diagrams required at short notice by the busy executive, manager or chemist in any food business, large or small.

In addition to the complete technical and commercial information contained in over 1,000 pages of vital information to the Food Industry (and the appropriate tables and illustrations) the enquirer finds essential up-to-date facts about products and plant of real help to him in perfecting his processes and organization, as well as in selecting the right materials and equipment necessary to him.

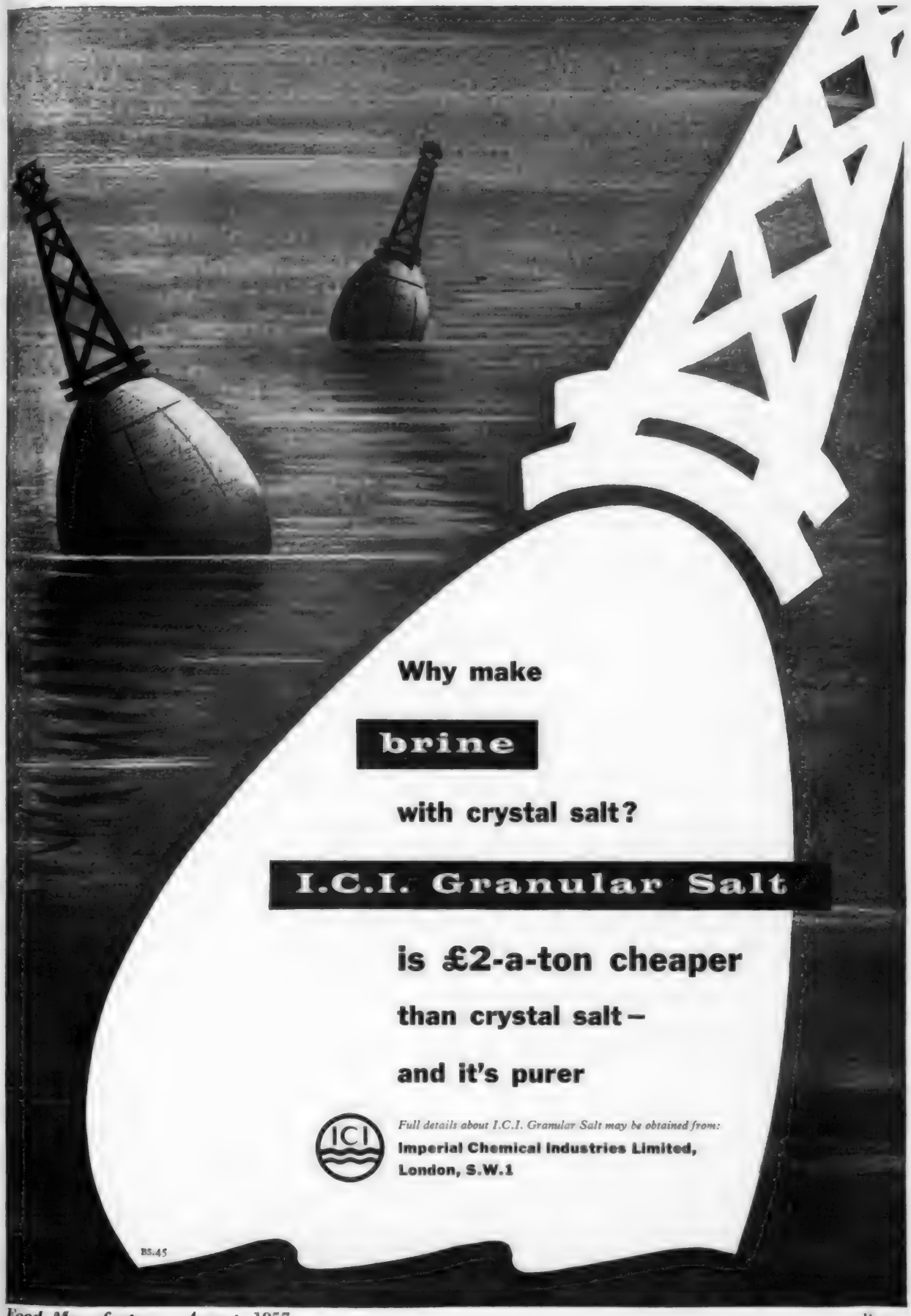
Comprehensive and invaluable indexes, covering Suppliers' Names and Addresses, Products and Trade Marks are also included.

Compiled by: W. B. Adam, M.A., F.R.I.C., A. J. Amos, PH.D., B.SC., F.R.I.C., H. C. Appleby, M.INST.F., A.M.I.MECH.E., J. Valentine Backes, A.R.C.SC., D.I.C., F.R.I.C., J. R. Burrell, V. L. G. Charley, B.SC., PH.D., the late T. Crosbie-Walsh, F.R.I.C., C. L. Cutting, B.SC., PH.D., J. G. Davis, D.SC., PH.D., F.R.I.C., D. Dickinson, M.SC., PH.D., F.R.I.C., E. F. Eaton, F.R.I.C., F. Hirst, M.SC., A.R.C.SC., M. K. Schwitzer, M.I.MECH.E., F. H. Slade, A.M.I.MECH.E., C. T. Williams, and the staff of *Food Manufacture*.

Obtainable through your usual bookseller

LEONARD HILL [BOOKS] LIMITED

9 EDEN STREET • LONDON • N.W.1


Why make
brine
with crystal salt?
I.C.I. Granular Salt
is £2-a-ton cheaper
than crystal salt—
and it's purer
ICI
Full details about I.C.I. Granular Salt may be obtained from:
Imperial Chemical Industries Limited,
London, S.W.1
BS.45

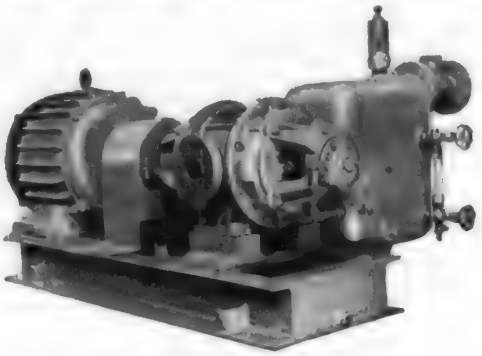
ONLY CLEAN AIR CAN REACH YOUR PRODUCT FROM THIS PUMP!

'NASH HYTOR' CLEAN AIR COMPRESSOR

Regd. Trade Mark

IT'S THE SCRUBBING ACTION OF THE LIQUID SEAL AND ENTIRE ABSENCE OF INTERNAL LUBRICATION

NO FILTERS OR AFTER COOLERS



ONE MOVING PART NO METALLIC CONTACT

British Made

By NASH ENGINEERING CO. (Great Britain) LTD.

Further details with pleasure from Sole Agents and Service Engineers for BRITISH ISLES

NORMAN ENGINEERING COMPANY

HEAD OFFICE: Hytor Works, Commerce Way, Purley Way, Croydon Telephone: Croydon 2278-9

NORTHERN OFFICE: 136 Royal Exchange, Manchester, 2 Telephone: Blackfriars 1033

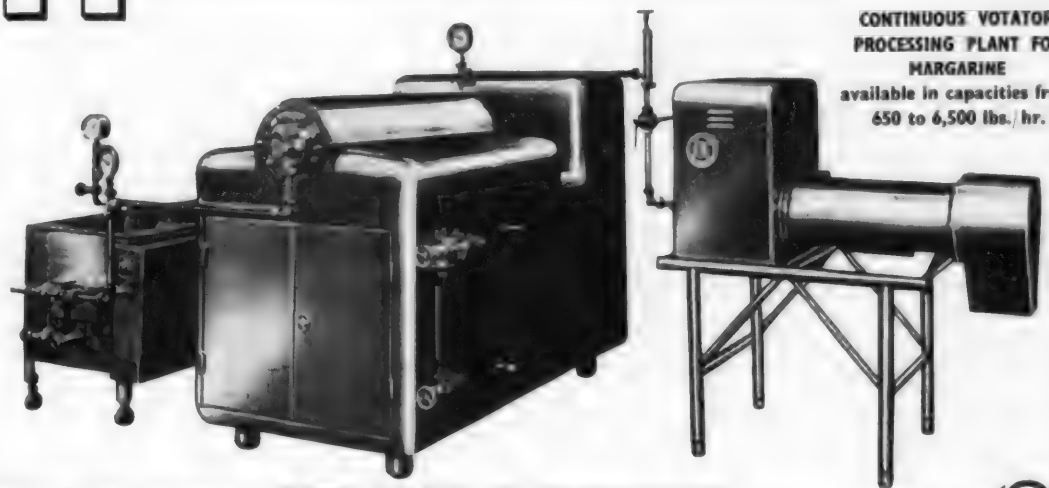
Rayner's

Flavouring essences

known for over 100 years as the best

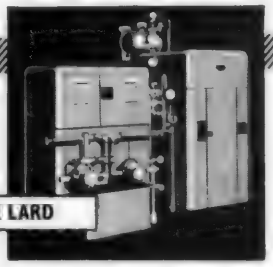
RAYNER AND COMPANY LIMITED LONDON N18

IF you have a food processing problem

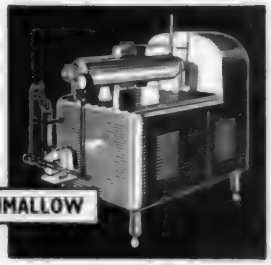


CONTINUOUS VOTATOR PROCESSING PLANT FOR MARGARINE
available in capacities from 650 to 6,500 lbs./hr.

Illustration shows Votator Margarine Unit Model M41A Capacity 1,500 to 2,000 lbs./hr.

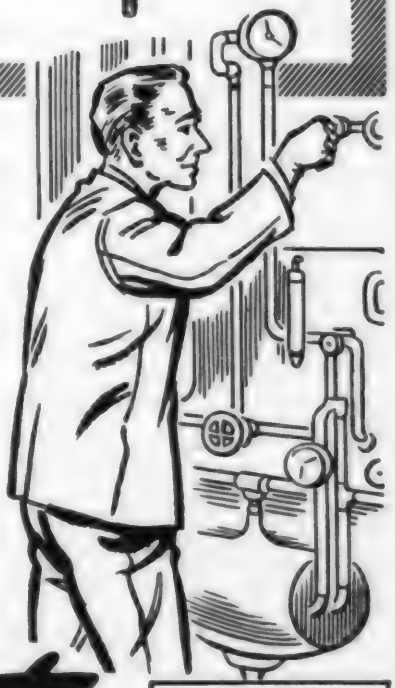


FOR LARD



MARSHMALLOW

CONDENSED MILK



OUR PROCESS ENGINEERS WILL HELP YOU TO SOLVE IT

Whether you are concerned with processing edible fats, or any other viscous heat-sensitive food product, you can enlist the assistance of Johnson's Technical Staff backed by Girdler's 30 years experience and our fully-equipped Votator Pilot Plant, comprising various Votator Laboratory Units arranged for heating by steam or hot water and for cooling by Freon or cold water. Other ancillary equipment is also available. All over the world Votator Continuous Processing Apparatus is being used for automatic production of Margarine, Lard, Marshmallow, Soups, Sauces, Gelatine, Turkish Delight, Starch Jelly, Biscuit Cream and many other well-known foods and sweets. The product in its final state is superior in texture and flavour. Write for our illustrated literature.

★ Votator

CONTINUOUS PROCESSING APPARATUS

Johnson's

A. JOHNSON & CO. (LONDON) LTD.

PILOT PLANT SERVICE

Enlist the services of our Process Department and fully equipped Votator Laboratory for developing new applications or improving existing ones for the heating, cooling, crystallising, etc., of viscous or liquid materials by closed-processing plant.

WORKS & SALES OFFICE: DUKES ROAD, WESTERN AVENUE, ACTON, W.3
Telephone: Acorn 6061 *Telegrams:* Agenticum Telex London.
HEAD OFFICE: AFRICA HOUSE, KINGSWAY, LONDON, W.C.2

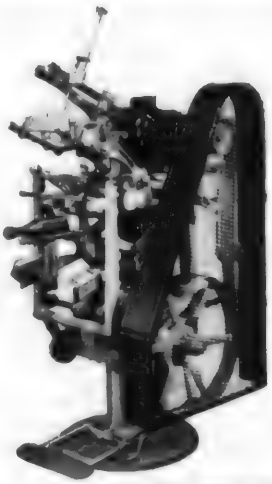
★ *"Votator" is a trade-mark which applies only to the products of the Girdler Company or their licensees.*

PURDY
LABELLING MACHINES

INVEST IN THE BEST!

"JUNIOR"

The Purdy "Junior"—in extensive use throughout industry—is the smallest of the large Purdy family. It is an automatic hand-fed machine designed to apply one or two labels to round or rounded containers such as bottles, jars, cans, etc. The illustration shows a bottle having just a simple BODY LABEL applied. This model can also be fitted to apply a TOP STRAP to any bottle, or a Sealing Strip to any carton within its range. Maximum output up to 40 per minute dependent to some extent upon the work handled, estimates being given when samples of such are submitted to us.



Use
PURDEX GUM
in all your
Labelling Machines

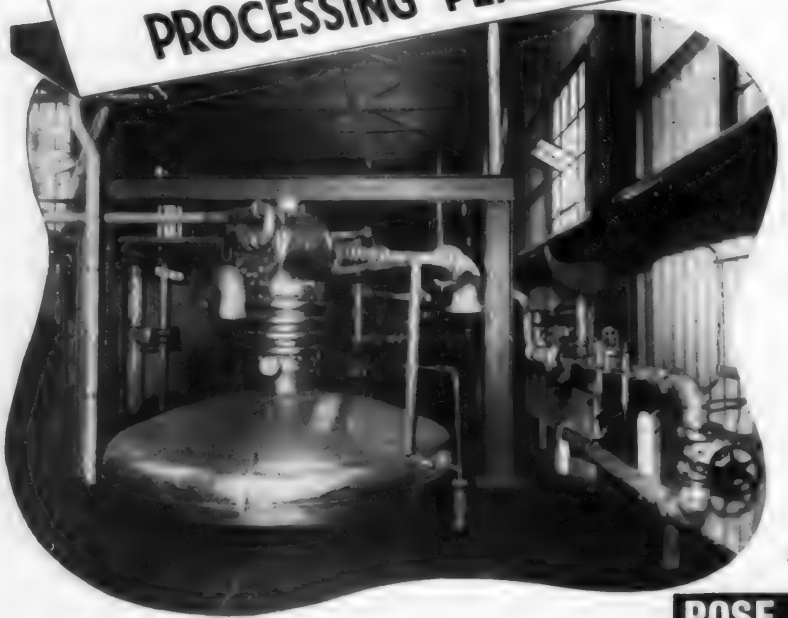
THE EXPERIENCE OF HALF A CENTURY IS AT YOUR SERVICE

PURDY MACHINERY CO. LTD.

'Phone & 'Grams: ASSOCIATED WITH FARROW & JACKSON LTD. ROYal 8401

41-42 PRESCOT STREET, LONDON, E.1

OILS & FATS PRODUCTION AND PROCESSING PLANT



Three Unit Continuous Deodorising Plant
(Courtesy of The Southern Oil Co. Ltd.)

ROSEDOWNS

Already proved in service, the Continuous Deodorising Plant installed by Rosedowns offers the following advantages to Refiners:-

- The hot oil comes into contact with only nickel or stainless steel.
- Taste and smell compounds cannot reflux back to the oil.
- Operates at high vacuum without prolonged heating of oil.
- The oil cannot be contaminated by air leaks.
- Low steam demand. Automatic in Operation. Feed Stock changes made easy.
- Complete technical services.

DETAILS ON REQUEST

ROSE, DOWNS & THOMPSON LTD.
OLD FOUNDRY · HULL · ENGLAND
MEMBER OF THE POWER-GAS GROUP

A LONG RUN FOR YOUR MONEY

The final stage in food canning — an industry where continuity of output and a clear floor are essential. This can conveyor is powered by an electric motor with Renold stock chain drive — a combination which achieves both objects.

For conversions or new equipment specify **RENOLD stock chain drives.** Quiet, positive and smooth running, they will give you years of dependable, trouble-free service, outlasting other types of transmission many times.

Drives from fractional to 140 h.p. can be supplied **FROM STOCK** in 25 different ratios, easily selected from chart in our Catalogue Ref. 116/93

RENOLD

STOCK CHAIN DRIVES

RENOLD—*the FIRST name in precision chain*

RENOLD CHAINS LIMITED · MANCHESTER

The VILLAGE PUMP and the ROAST BEEF of OLD ENGLAND

WERE GREAT CONTEMPORARIES

But few in those far off days could have foreseen the great part that pumps would play in modern food production.

The S.E.D. "NEUMO" Mk IV Pump Unit has been designed to give great versatility with high efficiency and low running costs. Pneumatically operated and supplied in a variety of materials including ferrous and non-ferrous, various grades of stainless and in its latest form P.T.F.E., this remarkable little pump is capable of pumping the widest possible range of fluids. Considerable heads can be raised satisfactorily on difficult liquids as the double acting plunger system renders the pump extremely positive. The disc valves may be readily removed complete within their own cage and all parts are interchangeable and fitted in minutes.

NEUMO MK IV
PUMP UNIT

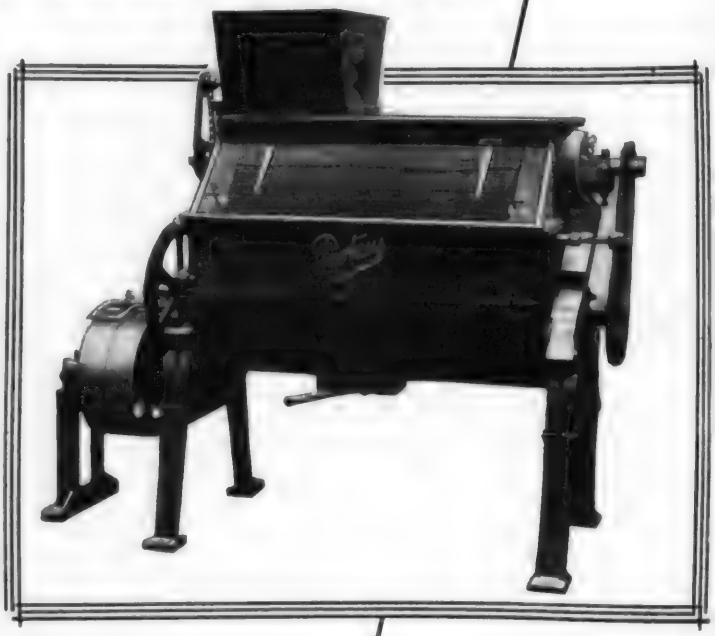
For literature or demonstration please write to:

KINGSBOURNE PRODUCTS LTD
South Coast Road, Peacehaven, Sussex. **Phone: PEACEHAVEN 2115**

ATLAS SIFTERS AND MIXERS

ideal for self-raising flour, powders etc.

The highest possible yield with the lowest operational costs combined with perfect blending in the minimum time, make the Atlas Sifter and Mixer a popular choice. Designed by Porteus experts and built by Porteus craftsmen, the Atlas range of Sifters and Mixers represents the very best in economy and efficiency of operation.



PORTEUS

GEORGE PORTEUS & SONS (LEEDS) LIMITED
LEEDS BRIDGE WORKS · LEEDS 10

Telephone: 22991
Telegrams: Elevator Leeds

GP. 124

he didn't know

Sellotape simplifies the job

REGD. TRADE MARK

saves time—saves money

It's odd, indeed, to find someone who doesn't know that Sellotape sealing simplifies the job. But there's every excuse for not knowing the *right* tape for the job. Sellotape make so many tapes — for all kinds of special needs. Maybe you are missing the very one that's right for *your* job. Why not let our Sales Service Department advise you? Better still, let our technical representative demonstrate on your own premises how Sellotape sealing with the *right* tape can save you even more time and money. Simply 'phone BIShopsgate 6511.

In the Sellotape Group of Self-Adhesive Products

Sellotape LABELS—
the simple answer to labelling on wood, metal, glass, plastics, rubber and rubberised surfaces, leather, cloth fabrics, etc.

Sellotape AD-SEALS—
combine advertising with parcel sealing in one operation.

Sellotape AD-STRIP—
puts eye-level advertising at the point-of-sale.

Sellotape is the Registered Trade Mark of Adhesive Tapes Ltd.

Sole Distributors in the U.K.:
THE INDUSTRIAL SELLOTAPE DIVISION of Gordon & Gotch Ltd., 8-10 Paul Street, London, E.C.2

MANUFACTURERS

British Rayophane Limited

WIGTON
CUMBERLAND

* * *

WORLD-WIDE DISTRIBUTION

TRANSPARENT CELLULOSE FILM

MOISTUREPROOF ANCHORED-WATERPROOF & NON-MOISTUREPROOF

HEAT-SEALING GUM-SEALING AND TWIST-WRAPPING QUALITIES

REELS & SHEETS (COLOURLESS & COLOURED)

RAYOPHANE FOR PROTECTION AND WRAP-APPEAL

* * *

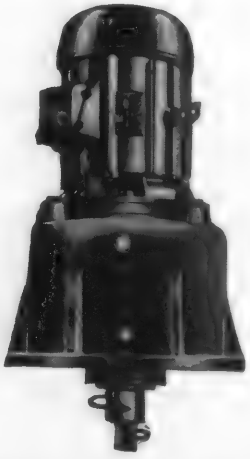
SOLE SELLING AGENTS

FELBER, JUCKER & CO. LTD.

LONDON · Thames House
Queen St. Place, E.C.4
Tel.: CITY 1087 (4 lines)
Grams: Felber, Stock, London

MANCHESTER: 29 Peter Street
Tel.: Blackfriars 3337 (6 lines)
Grams: Felber, Manchester

High Efficiency
Heavy Duty
Robust Construction
Negligible Maintenance



Electropower Gears are widely used in the Food manufacturing industry, and a very large selection of units is available from fractional to 200 h.p. Also special units for mixing vessels. Ask for details of Contra-Rotating Co-axial Shafts Units.

Electropower Gears Ltd

KINGSBURY WORKS, KINGSBURY ROAD, LONDON, N.W.9
Telephone: COLindale 4621-3 Telegrams: Lektropowa, Hyde, London

STAINLESS STEEL PLANT
designed to meet your needs

200 gallon steam jacketed pan

This 200 gallon Stainless Steel stationary type Steam Jacketed Pan is designed to withstand a working steam pressure of 30 lbs. per square inch. Polished inside and de-scaled outside, this vessel is supplied complete with motor, agitator, and hinged and flanged cover.

Stainless Steel Vessels will meticulously follow your specification. We have technical representatives who are available to discuss your design and fabrication problems, without obligation.

May we send you illustrations of plant which we have made and supplied —mostly 'to order'—to widely differing industries?

STAINLESS STEEL VESSELS
(LONDON) LIMITED

MANORGATE ROAD, KINGSTON-ON-THAMES, SURREY. Telephone: Kingston 5625 (5 lines) Telegrams and Cables: Esesvessel, Kingston-on-Thames

By appointment to Her Majesty Queen Elizabeth II. Engineers.

ALFRED DODMAN & CO. LTD.

By appointment to Her Majesty Queen Elizabeth II. Engineers.

Telegrams: "Dodman, King's Lynn." *Telephones:* 2720 & 2784 King's Lynn.

HIGHGATE WORKS, KING'S LYNN

Manufacturers of Canning Machinery

including:

PEA VINERS	STEAM CRANES
PEA GRADERS	COOLING TANKS
PEA SOAKING TANKS	MACEDOINE MIXERS
DUO WASHERS	BUCKET ELEVATORS
ROD WASHERS	PULPING MACHINES
SLAT WASHERS	SLICING MACHINES
INSPECTION TABLES	HAND PACK FILLERS
BLANCHERS	CHERRY STEMMERS
PEA BREAKERS	CHERRY DECLUSTERERS
RETORTS AND BASKETS	VEGETABLE PEELING MACHINES

Boilers also supplied to the Canning Industry

LONDON OFFICE: 49 LEADENHALL STREET, LONDON, E.C.2 ● *Telephones:* Royal 1759 & 1750

CONSULT

BCH

CITRUS FRUIT MACHINERY

HALVING
REAMING OR GOUGING
CHIPPING
SHREDDING
SHAVING OR STRIPPING
CHOPPING
SLICING
DICING
PULPING OR SIEVING
STEAMING
FILTERING
BOILING
CANDYING
SYRUPING
COOLING

PEEL SPLITTING or SEPARATING MACHINE for essence manufacture, etc.

ORANGES, LEMONS, LIMES
GRAPEFRUIT, CITRON
PASSION FRUIT, etc.

WM. BRIERLEY, COLLIER & HARTLEY, LTD.

Established 1835 **BORO WORKS, ROCHDALE.** Telephone: 4181

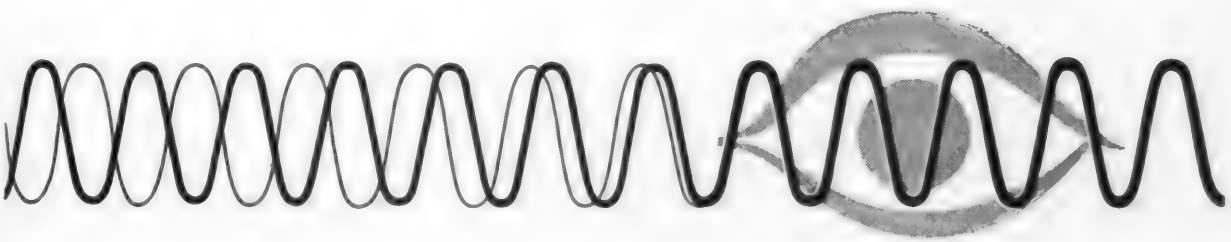
London Office: SUNRIDGE, RUDEN WAY, EPSOM DOWNS, SURREY. Telephone: Burgh Heath 2749

Largest Jam and Confectioners' Machinists in the Trade

Electronic control does it quicker

Automatic control cuts out innumerable hold-ups in production and adds valuable time to every working day. It can be applied in a great many different ways, from a simple timer that stops and starts machines, to the complex feed-back devices that regulate machines against a standard reference while they are in action, as in register control on colour-printing presses.

Whatever your process you would find it well worth while to consider automatic control in one form or another. It is more exact than is humanly possible; rejects are reduced; quality is improved; the flow of production is quicker and smoother; it uses little current and calls for little maintenance. In fact, you get higher production at lower cost. This is only one of the ways in which electricity is playing a vital part in the drive for higher productivity.



Electricity for Productivity

Ask your ELECTRICITY BOARD for advice and information, or get in touch with E.D.A. They can lend you, without charge, films about the uses of electricity in industry. E.D.A. are also publishing a series of books on Electricity and Productivity. Titles now available are: Electric Motors and Controls, Electric Resistance Heating, Higher Production, Lighting in Industry, Materials Handling, and the latest addition to the series, Induction and Dielectric Heating. Price 8/6, or 9/- post free.

Issued by the British Electrical Development Association, 2 Savoy Hill, London, W.C.2

Edible Oils and Fats

AND ALLIED MATERIALS

For the Manufacture and Preparation of Food

S. BRAMWELL & CO., LTD.

FOUNDED 1875

4 BROAD STREET PLACE
LONDON, E.C.2
LONDON WALL 5901

PRODUCE EXCHANGE
MANCHESTER, 4
BLACKFRIARS 6311

BENNETTS

Plant and Equipment for the Food and Dairy Industries

Wheeled trucks in stainless steel

BENNETT, SONS & SHEARS, LTD.,
9-13 GEORGE STREET,
MANCHESTER SQUARE, LONDON, W.1. TELEPHONE: WELBECK 8201 (6 LINES). WORKS: BIRMINGHAM, LEEDS, LONDON

. . . *and of course*

HYPAK
POULTRY BAGS

Keep your name to the fore with your specially printed poultry bags.

LET **HYPAK**

Specially Printed
SAUSAGE MEAT PACKS INCREASE YOUR TURNOVER THIS CHRISTMAS

This is the modern way of handling and presenting sausage meat to the consumer, attractively, and hygienically packed, protected from contamination. It retards discoloration and prevents drying out. It saves selling time, increases the unit of sale, thereby increasing turnover. Special designs incorporating name, brand and trade mark can be printed on Hypak Sausage Meat packs—the Hypak design department is available for this service—get in touch with us now, and be ready to meet the Christmas market.

THE HYPAK DIVISION of the OPPENHEIMER CASING CO (UK) LTD

159-165 HARROW ROAD, LONDON, W.2. Telephone: PADdington 7431-7 EDINBURGH · BELFAST · DUBLIN

What is the secret of the perfect toffee ?

You don't have to look into the crystal for the answer to a bright future in toffee making. For over 50 years *NUCOCOS*, the supreme confectionery butter, has been the lucky star of quality toffee manufacture.

NUCOCOS gives resistance to stickiness, candying and softening. It increases the shelf life, and gives an added quality to toffees by reason of the extra creaminess it imparts . . . it's the way that toffees made with *NUCOCOS* go down, that puts sales up.

Our Advisory Department is always at your service and will be happy to provide full technical details of *NUCOCOS*.

NUCOCOS makes good toffees taste better

LODERS & NUCOLINE LTD.

Southern Area
UNILEVER HOUSE - BLACKFRIARS LONDON E.C.4 - Tel CENtral 6323

Northern Area
LIVERPOOL ROAD - WARRINGTON
LANCS - Tel WARRINGTON 800

Scotland and Northern Ireland
19, BLYTHSWOOD SQ - GLASGOW C.2.
Tel GLASGOW CENTRAL 8921

LN 33-5-100

FOOD MANUFACTURE

Volume XXXII. Number 7 | Published Monthly | August 1, 1957

Editorials - - - - - - - - 357

Pickerings turn a Mill into a Cannery - - 361

A Rational Procedure for the Hot Smoke Curing of Fish. *By Dr. D. J. Tilgner* - 365

New Sugar Dryer and Cooler - - - 369

Nisin in Food Technology—I. *By H. B. Hawley* - - - - - - - - 370

The Appert Institute - - - - - - 377

Rape Seed Oil as a Food. *By Joyce L. Beare* 378

New Techniques in Beer Manufacture - - 385

Determination of Starch Purity with the Kent-Jones and Martin Colour Grader. *By Y. Pomeranz, Chem. Eng.* - - - 386

When the Manufacturer is Liable. *By Lord Meston* - - - - - - - - 389

Advances in Food Technology - - - 330

Machinery and Equipment - - - 391

News Digest - - - - - - - 393

Food News Overseas - - - - - - 400

Packaging - - - - - - - - 402

Trade Marks - - - - - - - 404

New Companies - - - - - - - 404

Information and Advice - - - - - 405

Recent Patents - - - - - - - 406

A PUBLICATION OF THE LEONARD HILL TECHNICAL GROUP—ENGLAND: STRATFORD HOUSE, EDEN STREET, LONDON, N.W.1. EUSTON 5911. UNITED STATES: 3 VILLA DRIVE N.E., ATLANTA, GEORGIA; 498, S. SAN VICENTE BLVD., LOS ANGELES 48, CALIFORNIA; 1808, UNION BOWER ROAD, IRVING, TEXAS; 121, WARD PARKWAY, KANSAS CITY 12, MO.; 681, MARKET STREET, SAN FRANCISCO 5, CALIF.; 19 WEST 44TH STREET, NEW YORK 36; 35 EAST WACKER DRIVE, CHICAGO, ILL. ITALY: VIA FILIPPO TURATI 3, (PALAZZO GIARDINO), MILAN. SWITZERLAND: FORCHSTR. 99, ZURICH 7 32. HOLLAND: CENTRAL BUREAU VOOR VERKOOPONTWIKKELING, VECHTSTRAAT 10, HEEMSTEDE, HAARLEM. GERMANY: AUF DER REIDE 20A, DUSSELDORF-UNTERRATH. FRANCE: 8 RUE GRANVELLE, BESANCON, DOUBS.

5,000,000 PEOPLE MUST EAT

Sussex Express & County Herald

Hastings & St. Leonards Observer

Folkestone, Hythe & District Herald

Folkestone & Hythe Gazette

Worthing Herald

Eastbourne Gazette

Eastbourne Herald Chronicle

Bexhill-on-Sea Observer

Shoreham Herald

Crawley & District Observer

East Grinstead Observer

and, traditionally, eat well when holiday-making in favourite South-East England — Folkestone, Hastings and St. Leonards, Bexhill, Eastbourne, Worthing.

Selling to those

who cater for this annual average invasion of 5,000,000 visitors between June and September, offers a bonus market worthy of the special attention of Food Manufacturers and their Advertising Agents.

The only advertising medium

covering the whole of this prosperous area is the South Coast Group of eleven influential papers, A.B.C. circulation 161,746—at 65/- per s.c.i., less than 5d. per inch per thousand.

Include it in your next advertising schedule

SOUTH COAST GROUP

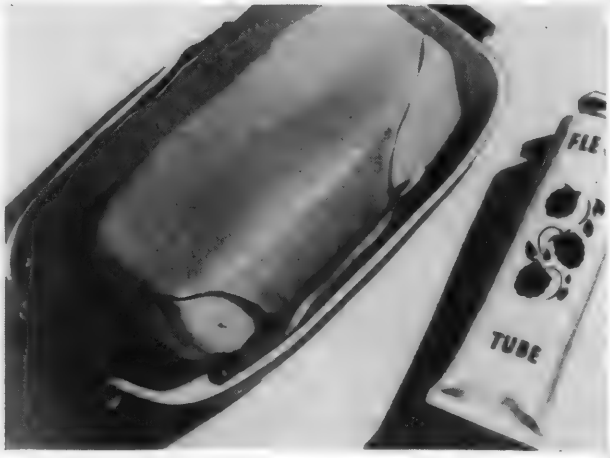
THE LARGEST CIRCULATION IN THE AREA

LONDON OFFICE: LENNOX HOUSE, NORFOLK STREET, W.C.2

Temple Bar 6591-2-3

Joint Managers: S. H. Roberts and N. J. Martin

you have the foods...



...we have the tubes!

Recent market research has revealed a fast-growing public demand for more and more food in tubes. You have the appropriate foods—we have the perfect tubes. Together we can capture this market . . . can cater for the vast potential demand . . . can reap the benefits of enterprise in a relatively unexploited field. How can it be done? Write *today* to the Sales Manager, Flexile Metal Company, for details of the only *complete* tube service to the food industry.

HAVE YOU SEEN THIS?

Be sure you get a copy of this new Flexile brochure on Food in Tubes. Phone or write for your copy NOW!

FLEXILE OF STEVENAGE

FLEXILE METAL COMPANY LTD · BESSEMER DRIVE · STEVENAGE · HERTS · STEVENAGE 1491

FOOD MANUFACTURE

Vol. XXXII, No. 8 August 1, 1957

Chemicals in food

A GREAT deal has been said about the possible dangers to the consumers resulting from advances in food technology. These risks can and should be minimised. This opinion, expressed by such an authority on the pharmacology of food additives as Professor A. C. Frazer, President of the British Food Manufacturing Industries Research Association, should do something to offset the many tirades which have been launched in recent years—often by people with little authority to speak—against the methods now commonly employed in the processing and preservation of foods. Speaking at the recent annual general meeting of the Research Association, Prof. Frazer went on to emphasize that the most important single factor which could be used to safeguard public health in this respect was an increase in the application of modern research methods to the study of the chemical composition of foods and of their effects upon the living body. A great deal of uninformed and often somewhat hysterical criticism has been aimed at food manufacturers for their employment of various food adjuncts, and it is heartening to hear so sane an expression of opinion from a person of such prominence in both the food and medical worlds.

Antibiotics

ONE class of substances which figure prominently in current deliberations about food additives are the antibiotics. Some have been successfully used as preservatives, and in the U.S., which has very strict food laws, permission for limited use of *Acronize* was granted some time ago. In this issue we publish as a contribution to discussion on the general subject of antibiotic preservatives an article on nisin, an inhibitory metabolite produced by a cheese-starter organism. In certain types of cheeses nisin is propduced naturally, and it is now fairly widely used in the manufacture of processed cheese and cheese spreads. Research has shown it to be remarkably non-toxic. One argument against antibiotics is that their widespread use in foods might impair their therapeutic value. However, not all antibiotics have medicinal properties, and nisin is such an antibiotic. Therefore this objection cannot be raised against it. There are other considerations, of course, notably the fear that antibiotics might be used as a substitute for hygiene. The whole question of antibiotics in food is now being studied officially, and it is to be hoped that a clear lead will soon be forthcoming to bring order to a confused situation.

Process control

IT is not always necessary for a food manufacturer to install expensive laboratory equipment or to employ qualified scientific staff in order to keep a close control over his canning process. By keeping a systematic watch on those factors which are known to give rise to most trouble, the small manufacturer of limited means can do much to eliminate spoilage of his products. This is made abundantly clear in a report issued by the South African Fishing Industries Research Institute. By instituting a system of factory process control, eight test factories were able to produce significantly fewer faulty cans, and the results of the test were so favourable that many other companies not taking part in the test have now modified their plant and operating procedure to comply in some measure with the conditions laid down.

The control system adopted, which is described in a memorandum issued by the Institute, was simple enough to cause little or no interruption of normal factory routine, and managers reported little difficulty in putting it into operation. Emphasis was placed on such procedures as the recording of temperatures in thermal processes, the checking of residual chlorine in cooling water, and the frequent examination of can seams. The latter procedure was found to be particularly important. The report points out that process control procedures of this nature have much to recommend them when compared with incubation and microbiological tests, for as well as being much less expensive they give results in a much shorter time. Defects can thus be remedied before production has been affected on a large scale, and batches not conforming to specification can quickly be isolated from the rest of the production.

The idea of systematic process control is, of course, well known throughout the food industry, but the report provides a salutary reminder of its value to the smaller manufacturer.

Moscow's monster abattoir

Moscow's principal meat products factory appears to suffer from being too big. It is said to be the largest of its kind in Europe, employing 13,000 workers and with a capacity for handling up to 4,000 cattle, 8,000 pigs and 8,000 sheep a day. It is described as a huge multi-storey building, constructed on the American pattern and seems, as far as Moscow is concerned, to be very far in advance of its time, because at present there are not enough animals for it to slaughter.

Meat animals for the abattoir have to come from places as far as 400 miles away on a very slow railway. Delivery speed is estimated as about 6 to 10 m.p.h. which puts the cost of transport of live animals up to 11·1% of their value and to 42·8% of their slaughter costs. The quality of the cattle is said to be very inferior and the Russians are doing their best to improve herds.

An interesting feature on the slaughtering floor is the stunning method. A 380 volt line is connected with the stunning boxes so that the animals receive the shock through the legs.

There are separate slaughtering lines for cattle, sheep and pigs and also a universal slaughtering line to cater for the huge supply of animals which comes in the late autumn. It is said that up to 10,000 pigs can be slaughtered daily using this line.

In the meat cutting department new multi-conveyors have been installed which are said to increase labour efficiency in the cutting and boning line by 20 to 25%. The heating system in the sausage department has been converted to gas in order to improve working conditions and costs. Sausages are electrostatically smoked and by this method the smoking cycle has been reduced from 70-78 hr. to 8-10 min. with a corresponding saving of floor space. Electrostatic smoking is also used successfully in other Eastern European countries for fish.

Pre-packaging on show

THE growth of self-service marketing and its influence on food packaging were well illustrated at the recent Grocery and Provisions Trade Fair. The fair was the first of its kind to be held exclusively for traders and manufacturers; the general public was not admitted.

The trend towards increased pre-packaging could be seen at several stands. Packaged processed cheese has been marketed for many years, but rindless natural cheese, accurately sliced to a standard shape and tightly wrapped in transparent film, represented an attractive new development. Provision merchants in general are obviously making increased use of transparent film, and many firms have redesigned their labels with the declared intention of improving self-service appeal. A novel development in this type of labelling has been introduced by one firm of canners who have repeated the main features of the label on the back of the can, but at an angle of 90 degrees to the main text. This enables the can to be displayed either upright or on their sides, and in each case an attractive, legible caption is presented to the customer.

Figures given by the Produce Pre-packaging Development Association give some idea of the rate at which the pre-packing idea is developing. This Association estimates that in 1954, 100,000 packs of vegetables and fruit appeared on the market. The present annual rate is estimated to be 110 million packs, and this is expected to rise to 200 million packs per annum by the beginning of 1958. Although these figures apply to primary commodities such as fruit and vegetables rather than to manufactured goods, their general significance is quite clear.

The application of quick-freezing techniques is further stimulating this practice of pre-packaging and quick-frozen foods, and the refrigerated display cabinets which are a pre-requisite to their sale were much in evidence at the Fair. The needs of the small man, wishing to introduce only a few speciality lines of quick-frozen foods, are now being increasingly studied, and unit-type appliances, which can be built up as business improves, are appearing on the market. Similar principles are being applied to the development of display shelves for non-refrigerated goods.

Vegetable oils—onward and upward

PRODUCTION figures for the commodities surveyed each year by the Commonwealth Economic Committee are so consistently record-breaking that on these grounds alone it will surprise no one to learn that the world production of vegetable oils in 1955-56 was the largest ever.* Provisional estimates indicate an increase of 7% over the figures for 1954-55 (19·83 million tons compared with 18·53 million) and about 40% in comparison with 1938-39. However, not only was the apparent *per caput* supply in 1956 larger than before the war, but, because of a relative decline in the consumption of these oils for soap production and other technical uses, a larger proportion of the total output was available for edible purposes. World production, particularly of copra and soya beans, will probably rise again in 1956-57. Commonwealth countries provided nearly a quarter of the estimated world oilseed and oil production in 1955-56 and over a third of the world exports in 1955. Prices generally in 1956 were higher, on average, than in the previous year.

* *Vegetable Oils and Oilseeds*, 1956. H.M.S.O., 5s. net.

Commonwealth exports in 1955 rose substantially and exceeded those of 1938 for the first time since the war. Higher exports of groundnut, linseed, and castor oil were made from India, and a considerable increase in supplies of copra and coconut oil from Ceylon, Malaya, and the Pacific Islands. Substantial exports of linseed were also made by Canada. The Commonwealth was a net exporter of vegetable oils and oilseeds for the third successive year, the expansion in the favourable balance to nearly four times that of the previous year being attributable mainly to the re-emergence of India as a very substantial net exporter, although heavier shipments from Ceylon and Malaya, and a further reduction in the net imports of the U.S. were important. Before the war the Commonwealth had large export surpluses of oils and oilseeds of the edible and edible-industrial groups and a relatively minor import balance of industrial oils and oilseeds. However, because of higher British consumption since the war and the considerable decline in shipments of oilseeds from India (also due to increased domestic consumption), the Commonwealth was a consistent net importer until 1952. A small export balance in 1953 was increased slightly in 1954, and with the marked improvement in 1955 the Commonwealth net exports in that year were nearly as great as in 1938. Lower Indian exports in recent years has been offset largely by heavier supplies from Nigeria and the Pacific Islands, while South Africa has become a net exporter and the Canadian import balance has been considerably reduced, as well as that of the U.K. In contradistinction, imports of vegetable oils and oilseeds into Western Europe have grown appreciably, and Commonwealth countries are now sending larger supplies to this region.

Welcome return

WE welcome the return to our pages after 20 years of Dr. Damaszy Jerzy Tilgner, the Polish food scientist (see p. 365).

Dr. Tilgner's last article for FOOD MANUFACTURE appeared in April, 1937 when he discussed the relationship of shrinkage to quality in canned smoked fish. At that time Dr. Tilgner, who had been a regular contributor, was connected with the Polish Ministry of Commerce and Trade. He had previously worked in several canning and food plants in Poland and the U.S.A. and for a short time he was with the research staff of the Fruit Products Laboratory of the University of California in Berkeley, investigating problems connected with frozen food. He is now Professor of Animal Products Technology at Danzig Polytechnic. He has written a number of books on food in Polish, German and French.

Food and pests

STORED foods are probably more vulnerable to attacks by pests than crops. Certainly the problems of pest infestation and pest control discussed in the latest *Pest Infestation Report for* 1956 (H.M.S.O., 4s. 6d., net.) have an almost frightening diversity. Our defences against infestation can still be greatly improved. Even with established methods, many gaps in technological knowledge still exist; and despite the great modern advances in synthetic insecticides, some foodstuff pests are costly and difficult to control. One of the worst beetle pests, *Trogoderma granarium*, had a well-defined area of operation until five years ago; now, and often in large numbers, it is spreading through Africa and a huge threat hangs over countries where maize is stored in large quantities. The chemical answer of fumigation is simpler to prescribe than carry out; storage space must be suitable if this treatment is to have any hope of success.

It is greatly to the credit of the D.S.I.R. that so much of the Pest Infestation Laboratory's work comes under the heading of "Colonial Liaison." The war of insects on man's food is international, and our own reliance upon imported foods for part of our diet bring overseas responsibilities as well as obligations at home.

Cocoa in West Africa is heavily infected by insects; it is also highly susceptible to taint. Control treatments have so far been limited to using pyrethrum sprays, but tests with DDT and gamma-BHC are to be carried out in Ghana and Nigeria. Samples will be sent to Britain for tasting and other tests. Mite control for Cheddar and Stilton type cheeses has been investigated, using C-14 radio-labelled gamma-BHC to study the rate of penetration. This was found to be very slow indeed—even six months after external application, no insecticide could be detected in Cheddar cheese at a depth of 5 mm. from the surface, nor at 8 mm. depth for Stilton. Repeated applications to cheese surfaces had little increasing effect upon the extent or pace of penetration.

Insect infestations in flour mills still constitute a major problem, and major research work on the use of contact insecticides is being planned. Eleven mills have been inspected and intensive "field research" in co-operation with the milling industry is a likely development of the near future. It would seem that more attention in the past has been given to the pest infestation problems of stored grain. In that field the new method of hermetic storage has encouraging possibilities; insect control is achieved because eventually insufficient oxygen remains for insect growth. However, if the grain is initially too moist, it becomes unacceptable for milling as flavour and odour changes due to anaerobic micro-organisms are not prevented.

Whether irradiation will supplant insecticides or

fumigants for pest control of stored foods must still be regarded as speculative. Work in conjunction with Harwell has been started, using cobalt-60 as a source of gamma-radiation. Two possibilities are being investigated; the direct killing of insects by irradiation, or the release of radiation-sterilised male insects into a food store so that female eggs are infertile. A large task of development research must be carried out before the value of either method can be assessed. Dramatic and optimistic stories about pest control by irradiation are dismissed somewhat tersely in the Report: "wait-and-see" seems to be wise and appropriate advice.

How to formulate cakes

"A POUND all round and a pinch" was the old baker's idea of a balanced formula for a cake. Nowadays, food technology is too complex for such rule of thumb methods, and many bakers whose idea of adjusting a cake recipe is "bunging in" additional flour will welcome the paper on formula balancing read to the British Cake and Biscuit Association's Technologists' Conference recently by Mr. J. A. Snelling.

Formula balancing depends upon a thorough knowledge of one's ingredients and also on the effect of one ingredient upon another, according to Mr. Snelling. He has classified cake ingredients into four groups: those which provide structure, *i.e.* flour and eggs; those which have to be carried by the first group, *i.e.* sugar, fat and milk; those which have an opening or lifting effect, *i.e.* sugar, baking powder, eggs and shortening; and those which restrict lightness, *i.e.* milk (or other liquids such as water) and reconstituted dried egg. The balanced formula contains only such a quantity of ingredients from the second group as can be successfully carried by those in the first. There should also be a similar balance between the opening effect of the ingredients in the third group and the closing effect of those in the fourth.

However, the "real money-spinner" of formula-balancing is formula re-balancing. This depends upon correcting faults in an otherwise balanced mixing, ensuring that full value is obtained from all ingredients used and adjusting an existing balanced formula to produce a cake at a given price. It is essential for the study of balance control to take one staple ingredient as a basis against which the ratios of all other ingredients can be compared. Flour is the most practical ingredient for this purpose so that it is only possible to make a change in the mixing by adding one or more of the other ingredients. For example, a large increase in the fat content of a cake must be compensated by corresponding increase in the structural content of the mixing, *i.e.* in either flour or eggs. As flour is the basic ingredient, eggs must be increased to take care of the additional fat.

An actual example of this theory in practice concerned a fruit slab-cake which proved unsatisfactory when the fats were replaced by a good quality shortening. On examining the formula it was found that someone at one time had reduced the egg content to produce a cheaper cake. This immediately resulted in an unbalanced formula with the egg content below that of the fat. Consequently, when a shortening with good creaming qualities was used there was not enough structural property in the mixing to withstand the additional expansion from the increased air content and it collapsed.

Using Mr. Snelling's Four Group theory, the egg was replaced until it equalled the fat and then the cost of the cake reduced by the addition of sugar and milk.

Combined preservatives

THREE methods of food preservation have been used in one experiment carried out at the American Meat Institute Foundation: radiation, refrigeration and antibiotics. With this massing of the big guns of food technology one would have expected the workers, W. R. Chesbro and C. F. Niven, to have at least attempted to triple the shelf life of the fresh beef they were studying, but they modestly aimed only at an "extension." Further, they were successful. According to the Institute's annual report, various combinations of radiation, antibiotics and sorbic acid, effectively extended the refrigerated shelf life of the beef.

Radiation alone (10^5 rep) markedly extended the shelf life as judged by total microbial count, but antibiotics (10 ppm) or sorbic acid (0·1%) alone were relatively ineffective. However, antibiotics and radiation occasionally displayed a synergistic effect, markedly delaying the advent of spoilage. The contaminating yeasts usually grew more rapidly in the presence of the antibiotics than in their absence, presumably due to lack of competition from bacteria. Therefore, sorbic acid was a useful addition to the combination as a means of impeding rapid yeast growth. The most effective antibiotics were the tetracyclines, all three of which appeared to be equally effective.

Poor refrigeration or meat having an initial high microbial count prevented any appreciable increase in shelf life. Limited taste panel results indicated a very low correlation between microbial population and organoleptic acceptability of the cooked meat.

The shelf life at 35°F., as judged solely by colour and physical appearance, was at least doubled by the combination of antibiotics and radiation. Ascorbic acid did not appreciably extend the keeping time.

Pickerings' Turn A MILL *into a* CANNERY

"Food Manufacture" reports on the transformation of a deserted cotton mill into a thriving cannery.

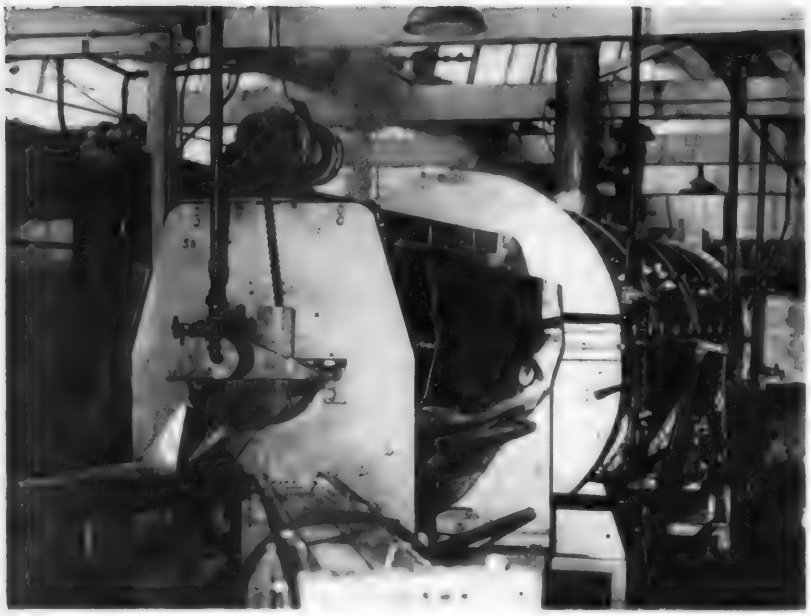
A NEW cannery, producing between 30 to 40 varieties of fruit, vegetables and other products—including about 100 tons of canned garden peas daily—has been successfully established in what was, last year, an abandoned cotton mill at Glossop in Derbyshire. The textile industry has been subject to recurring slumps and unfortunately, derelict mills are all too common in Derbyshire. Pickerings' Produce Peas, Ltd., who have had the enterprise to occupy and convert this mill, are to be congratulated on helping to bring new life and prosperity to Glossop while providing themselves with a fine, modern cannery at much less than the usual cost.

The transformation began just over a year ago when Pickerings' found that their production was out-growing their existing factories at Denton and Stockport. Pickerings', who celebrate their centenary next year, originally produced dried cereals and milled pearl barley, started canning in 1936. In 1943, Mr. Theodore West, a farmer and corn merchant who specialised in supplying canners with raw materials, became the majority shareholder and chairman. Under his chairmanship the canning side of the business was consolidated and expanded at a new factory in Stockport, while packet cereals continued to be manufactured in Manchester. However, this cereal factory and offices were destroyed during the heavy air raids on Manchester and another factory was bought at Denton. After the war the cereals side of the business returned to Manchester while Pickerings' continued to develop the production and sales of canned foods at Stockport and Denton. The demand for their canned goods grew—and has continued to grow—each year until eventually problems of production, communication, etc., became too difficult and Pickerings' decided to concentrate production in one factory.

The conversion

By their initiative in acquiring and converting this old cotton mill Pickerings' have a large new factory with all the improved features necessary for a modern cannery, at less than half the cost of a new

Above: **Lifting cans into retorts.** *Right:* **The old weaving shed, now housing a straight-run canning line. In the immediate foreground is part of the 150 ft. of fluming from the blanchers to the storage tanks.**



Blanching and washing peas on one of the three vegetable canning lines.

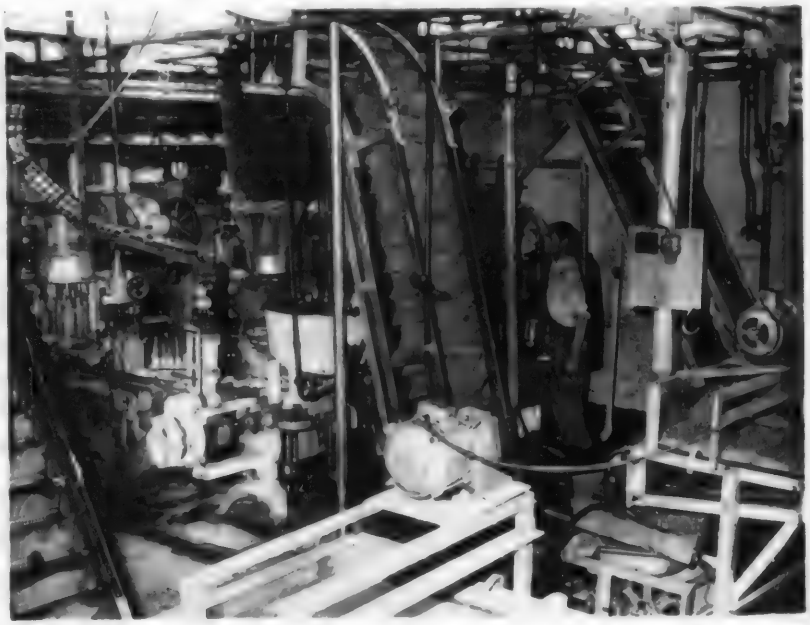
building. The factory stands in 12 acres of land. Its outward appearance is the same as when it was a cotton mill, but inside there are six canning lines: three for peas and other vegetables, one for canned rice pudding and two for fruits. The single-story weaving shed, which is said to have been one of the largest of its kind, has been converted into a straight-run production line and the communicating storied buildings are being used for storage. The office staff of over a hundred, the quality and analytical laboratories are accommodated in a three-story building adjoining the factory which was once used for finishing. Now it is composed of light and airy steel-partitioned offices which lead into a courtyard and overlook the old mill lodge. The new factory is under the managing directorship of Mr. R. M. West, the son of the chairman, Mr. Theodore West.

Most of the credit for the conversion goes to Mr. D. J. Dovey, the works manager, under whom it was carried out. Work on the building started last August when the floors were replaced, the drains and mains services laid, etc. The original floor was composed of massive flagstones which had to be taken up and replaced by a concrete floor with the appropriate drains, and a false wall was built around the production area. The new factory started production on December 8—a tribute to the speed and efficiency with which the work was carried out.

The cannery is situated in the old weaving shed, a single-story building nearly 400 ft. long and 96 ft. wide. Six canning lines, four pits accommodating the sterilising retorts, four glueing and labelling lines and six can conveying lines have been installed making the total length of the production area 224 ft. The rest of the shed is used for the storage of finished goods, cans and cartons. Drainage channels serving the canning lines and steriliser pits are connected by cross drains, and as a further aid to efficient drainage the floor beyond the end of these channels has been sloped. The whole shed is well lighted and ventilated.

Vegetable canning

The reception and preliminary preparation of raw materials takes place in sheds built outside the original unloading bay. The weaving shed is situated on low ground. The adjoining four-story structure has been built so that its second floor is on a level with the higher ground overlooking the cannery. This entrance has been extended to form a bay holding three flotation washers, served by bucket elevators made by the company's engineering department. Thus the lorries can be driven up to the second floor entrance, their contents unloaded on to the elevators and passed straight into the flotation washers. The peas have previously been vined and washed at Pickerings' depots near the actual farms.



Filling and seaming cans, after the peas have been passed by women inspectors.

One of the four labelling and glueing lines. The six canning lines and batteries of sterilising retorts can be seen in the background.

The peas travel from the flotation washers to the storage tanks along 150 ft. of flume channels arranged along the outside of the building and overlooking the canning shed.

The sturdily constructed four-story building adjoining the canning shed was once apparently used for the storage of cotton bales, etc. It now holds the graders and four blocks of storage tanks. Dry peas soak in these tanks out of season and they are used for garden pea storage during the season. As required, the peas are drawn from the bottom of these tanks and flumed by gravity into holding tanks at the commencement of each production line.

Canning now follows the conventional technique. Peas are released from the holding tank to a bucket conveyor which carries them into a blancher, where they are partially pre-cooked in scalding water, and transferred to the rod washers which cool them and remove skin and split peas. They next travel across a moving belt for visual inspection by female workers who extract any broken, badly formed or discoloured peas.

Meanwhile, cans received on pallets from the nearby Metal Box depot, have been unpacked and transferred to the filling machines along six interchangeable overhead conveyors. The inspected peas reach the filling machines and are filled with brine into the cans. The filled cans then travel through a high-speed (195 cans per min.) double seamer which seals the lid securely to the body of the cans. The filled and seamed cans are now ready for retorting. They are filled into large metal containers and transferred by electric hoist into one of a battery of sterilising retorts. After retorting, they are cooled, passed by conveyor belt through a labelling machine, packed into cartons which pass through a carton glueing and sealing machine and stacked by fork lift truck for storage, testing and despatch.

Corer

There are two fruit canning lines—one for pears, etc., and the other for soft fruits requiring a great deal of hand labour. An innovation on the first of these lines is an American made pear peeler and corer. Pickerings have three of these machines, and it is believed that there is only one other such appliance in the U.K. This machine eliminates the need for blanching. Normally pears are blanched when they are at a critical stage of ripeness. By using the new machine, the pears are canned before ripeness has developed to such a point that the firmness of the pear is affected. Consequently the canned pears are said to have a smoother finish and a firmer texture than is normally obtained. The machine also saves on labour costs as, although it is fed by hand, it automatically peels, halves and cores every pear presented at a rate of about 5 cwt. per hr.

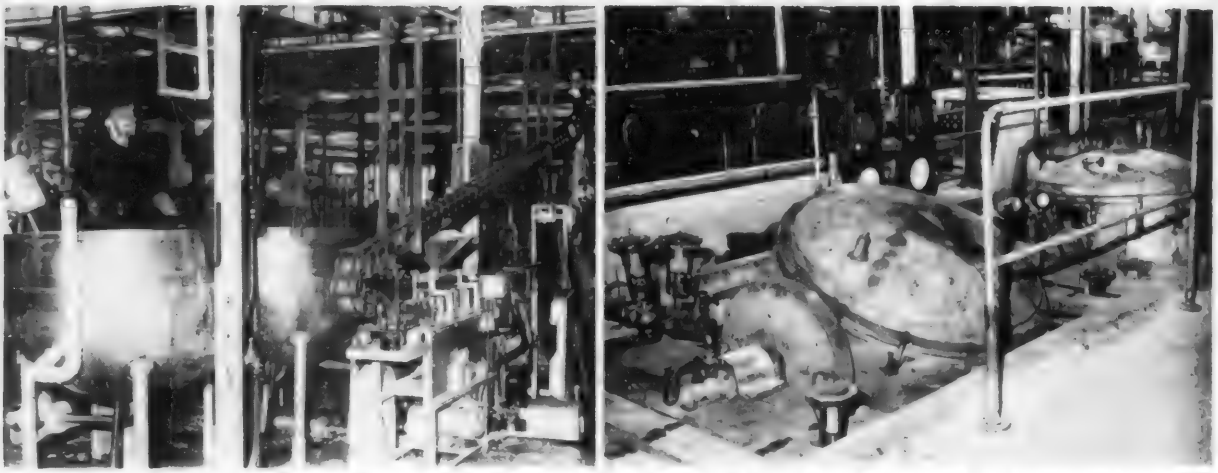
Canned rice pudding

One of Pickerings' best selling lines is canned creamed rice pudding. Basically there is nothing complicated about the process of canning rice pudding, but it calls for extremely accurate control of temperature and other conditions. Milk is brought in churns and heated in two stainless steel tanks. Cans are filled with rice through a specially designed filler, and milk and sugar is simultaneously filled through a filler designed and made by Pickerings' engineering staff. After seaming the cans are placed in special containers and cooked in rotating sterilisers. By rotating the sterilisers Pickerings' find that any risk of improper emulsification and hence lumpy rice is eliminated. The whole process is controlled by time schedule temperature recorders.

Water

The ideal cannery depends largely upon readily available raw materials, labour and water. Pickerings' new Glossop factory suffers from shortage of water, but this is compensated for by the availability of labour. The 200 regular factory employees include a large proportion of workers from Denton, Stockport and Manchester, while extra seasonal labour is easily recruited, particularly from among the West Indian immigrants in Manchester. A special bus is provided for the workers. Raw materials continue to be obtained from the company's suppliers at farms in Cheshire and Yorkshire.

Water supplies are difficult, but this problem is being tackled with the same energy that went into the



Canning rice pudding. Left, the operator standing behind the stainless steel milk tanks is watching the temperature recorders. Right are two of the rotating sterilisers. Temperature control is a very important part of the canning of rice pudding. Behind the sterilisers is the time-schedule temperature recorder panel.

conversion of the factory. A recirculating system is being built to pump water used for cooling cans after retorting to a cooling tower where it will be chlorinated, collected in a storage tank and recirculated. Additional storage tanks to hold 100,000 gal. of water are also being built.

The whole factory is an example of how ingenuity, initiative and hard work have transformed an unconventional site into what is an almost textbook conception of the ideal cannery.

Visionary Vitamin

VITAMIN A is not one of the more fashionable vitamins. It is consumed in relatively large quantities by addicts of vitamin supplements, but its presence in these compounds is often due to no more than its incidental occurrence in several of the richest natural sources of vitamin D. Indeed, if even the more knowledgeable members of the general public were to be asked, "What is the rôle of vitamin A in human nutrition?" it would be surprising if the question elicited anything more than a vague reference to the enhancement of one's ability to "see in the dark."

This paucity of knowledge on the part of the general public as to the functions of vitamin A is in many ways but a reflection of a similar lack of knowledge in more authoritative circles. This is amply demonstrated in the recent book by Thomas Moore, which is devoted entirely to the subject of vitamin A.*

Even so eminent an authority as the author of this work is able to devote only two pages to consideration of the mode of action of vitamin A, and has freely to admit that "we remain ignorant of the biochemistry of the vitamin throughout the greater part of the body."

One of the chief difficulties involved in the study of vitamin A in human nutrition has been the almost complete lack of occurrence of a simple deficiency of this principle. Vitamin A or its precursors are widely distributed in nature, and the body has more ample stores of the vitamin than probably of any other dietary essential. Consequently, it is almost impossible to study the clinical effects of a deficiency in vitamin A under circumstances in which these effects are not heavily overlaid with symptoms of gross malnutrition.

Nevertheless, an enormous amount of work has been performed on this subject, and little of it can have escaped the attention and critical scrutiny of the author of this book. A great deal is now known about the rôle of vitamin A in vision, and animal feeding experiments have enabled some of the gaps in our knowledge of the vitamin's function in other parts of the body to be filled. The author gives detailed accounts of these subjects and examines carefully our knowledge of the rôle of the vitamin in various physiological processes such as the sex functions, bone growth, detoxication, etc. The distribution of the vitamin throughout the healthy body is discussed in detail and changes associated with various illnesses are examined, although their significance is not always clearly understood. Interesting sections are also devoted to the comparative biochemistry of the vitamin.

About the general chemistry of vitamin A and related compounds a great deal more is known, and a full account is given of this subject. Nonetheless, it is probably for its study of the various aspects of the biochemistry of the vitamin, and for its interesting speculation where gaps in our knowledge exist, that the book makes its greatest contribution to the subject. A large number of references are quoted, and the book will clearly become a standard work of reference for anyone studying the sciences with which vitamin A is associated.

* *Vitamin A*. By Thomas Moore. 1957. Elsevier Publishing Co., London. Pp. 645+xvi. £3 16s. net.

A Rational Procedure for the HOT SMOKE CURING OF FISH

By Dr. Damazy Jerzy Tilgner*

To replace the somewhat "hit-and-miss" character of the traditional hot smoke curing process, the author and his colleagues have evolved a procedure based upon physico-chemical criteria. They claim that, as a result, the quality and keeping properties of the smoked product are improved and the productivity of the plant is increased.

HOT smoke-curing of meat and fish products is a very complicated process. The final result depends upon the rigid control of temperature, humidity and air-speed, the quality of wood used for smoke generation and the conduct of pyrolysis as well as the kind and quality of raw products destined for smoke curing.

The technique applied decides the quality and quantity of smoke constituents deposited upon the surface and in the tissue of the smoked product. It also affects its colour, flavour, palatability and storage value.

Until recently the method of hot smoke-curing was based, in practice, upon trial and error. Instructions found in literature could be rarely followed, since most of the industrial natural draught smoking kilns had neither sensitive nor efficient regulating and controlling devices.

This continuous changeability of the procedure, which is very dependent on external climatic conditions and the human factor, causes great variations in the quality, as well as yield, fuel consumption and turn-over of the conventional smoking kiln.

Rationalisation of the smoke-curing process

The hot smoke-curing process can be rationalised by applying certain physico-chemical criteria. The following three fundamental requirements should be observed:

(*a*) The partial drying of the animal product in order to remove 15-30% of the water content and to improve certain quality characteristics of the product;

(*b*) The thermal denaturation of the "raw" proteins resulting in the acquisition of full palatability of the animal tissue;

(*c*) The smoke-curing of the product in order to change its flavour and improve its storage value.

These requirements are met when the following conditions are observed:

(i) The partial drying of the product implies mainly the removal of surface water and of the outer layers of the tissue. The moist tissue is best suited to give up its water and during the early stages of the smoke-curing process the product is at the wet-bulb temperature. Because of the pronounced cooling effects the dry-bulb temperature can be increased without any adverse results upon the quality of the product.

In the concluding stage the lowering of the moisture content on the surface and outer parts of the product causes an approach to the temperature of the surrounding air in the kiln. This may result in toughening and even scorching of the outer layers if the temperature is excessive. This thermal deterioration in the concluding stage of drying and smoking starts at a temperature of 90°C. (194°F.) and has been confirmed by many other experiments at various times and is stressed by many authors. The effect of physical factors involved in drying animal tissue is by now fairly well established.[2, 3]

(ii) The effects of heat upon the eating quality of animal tissue and the nutritive value of proteins are by now fairly well established. Putnam described in detail the thermodynamics of protein denaturation.[4] This denaturation is a physical or intracellular but not a chemical change of the structure of natural proteins, provided that the temperature does not exceed certain limits.

The thermal denaturation of raw animal tissue to render it palatable is attained by reaching a temperature of 76-82°C. (170-180°F.). The lower temperature suffices for a delicate meat tissue containing little collagen. We have applied this range of temperature for many years for determining the final point in thermal processing of meat tissues.

Increasing the temperature unnecessarily above 90°C. (194°F.) causes a chemical breakdown with formation of hydrogen sulphide and release of certain chemical substances. This chemical breakdown of the protein molecule causes a significant change of the flavour profile with the appearance of an unfavourable sulphide note, especially pronounced in meats heated in closed containers.

The adverse influence of higher temperatures affects the metabolisable value of the protein and produces a detrimental effect on the nutritive value of the finished product.[5, 2] Evidently animal tissue cannot withstand higher temperatures without marked and severe changes.

(iii) Smoke-curing aims at improving the colour and palatability as well as the keeping quality of the finished product. It would seem advisable to add curing and colouring smoke during drying, and thus eliminate a

* Professor of Technology of Animal Products, Politechnika Gdańska, Poland.
See Editorial note in this issue.

separate operation or shorten the whole process. According to our experiments this proved advisable with herring and sprats, but not with the hot smoke-curing of cod.

Table 1. Variations in conventional hot smoke-curing of cod[1]

(control of 21 charges in the winter season.)

	Temperature range	Time range minutes
During the drying period	30-101°C. (86-214°F.)	40-90
During the cooking period	93-180°C. (199-356°F.)	40-115
During the smoking period	86-200°C. (187-392°F.)	23-80

Table 2. Curing smoke density and average optical density[7]

Optical smoke density — points of scale	2 (very light)	4	6	8	10 (very heavy)	correlation coefficient (r)
Volatile organic acids (mg/m³)	133·91	234·96	383·13	522·13	736·30	0·993
Phenols*	70·73	90·03	143·45	192·50	269·73	0·983
Total solids (g/m³)	0·1139	0·5893	0·9572	1·5111	2·0271	0·998
Deposition of solids on horizontal surface (mg./100 cm²/hour)	1·32	4·59	8·81	10·70	16·05	—

* By the bromometric method $C_6H_5OH + 3Br_2 = C_6H_2B_3OH + 3HBr$ which was titrated iodometrically.

Curing and colouring smoke control

Proper smoke-curing requires rigid control of all thermodynamic and physico-chemical conditions, which influence the composition and amount of curing smoke and its colouring and flavouring value. Much progress has been made in order to develop a more controllable and economical procedure. Invaluable pioneer work has been conducted in this field by the Fish and Fish Products Division of the Department of Scientific and Industrial Research at the Torry Research Station (Aberdeen) and the Humber Laboratory (Hull)[6] and also by research workers in other countries.

We measure the density of smoke by using a simple continuous photo-electric device based upon the absorption of light by a passing layer of smoke.[7]

A ten degree scale was adopted whereby the zero point corresponds to the maximum (1·2 mA) deflection of the milliammeter, when no smoke passes through the controlling device, whereas the smallest deflection caused by the thickest smoke corresponds to point ten. The scale 0-10 is divided into 10 equal segments, each point equalling a current flow of 1·2 mA. The measured smoke layer has a diameter of 70 mm. In our future work we intend to reduce the thickness of the smoke layer in order to be able to measure small deviations of the thickest smoke density.

Curing smoke was qualitatively and quantitatively characterised at 2, 4, 6, 8 and 10 degrees of the above smoke density scale. The amount of phenols, volatile organic acids and total solids dispersed in the smoke proved to be highly correlated (over 99%) with the smoke density. The deposition of the solid smoke particles on a measured horizontal and vertical surface under actual smoking conditions in the kiln was not correlated with the optical density of the curing smoke.

Our results proved that in spite of varying combustion conditions and differences in the temperature and humidity (10-30 g. H_2O/m^3) of the curing smoke, the existing differences in the content of the above mentioned main constituents were always sizable in the different smoke densities. This interdependence may prove of high theoretical and practical value.

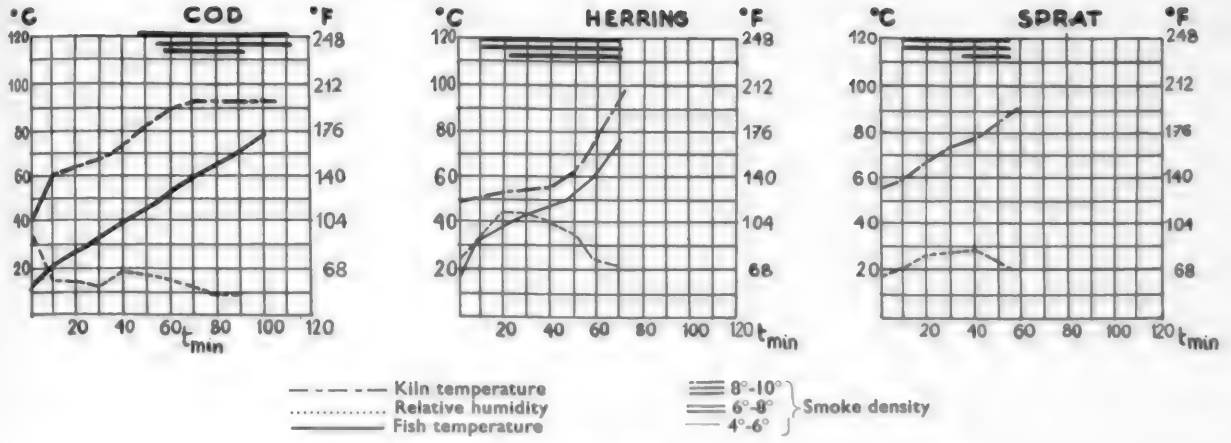
The required surface colouring of the product does not depend upon the amount of phenols,[8] but upon other smoke constituents which are least electrically charged and accelerated in an electrostatic field, *i.e.* all chemical constituents of a neutral nature, and thus mainly resins.[9] Our investigations proved that neutral smoke constituents possess a distinctive colour (from yellow to brown), which deepens readily, probably due to the polymerisation or autoxidation of the resinous constituents.[10] There seems to exist a correlation between these neutral constituents and phenols in curing smoke and hence the amount of phenols was regarded in the past by some workers as directly responsible for the proper colouring of smoke-cured products.[11, 12]

As to the flavouring agents, only those smoke constituents which are readily volatile in steam vapour are responsible for the highly desirable aroma and flavour notes in smoke-cured products. They constitute aldehydes and ketones, acids and volatile phenols (phenol, cresol and pyrocatechin). Their detection can be accomplished in a short time, serving as a valuable characteristic of the positive flavouring potency of the curing smoke.[13, 14] The qualitative analysis of the smoke value may be assessed also by objective sensory methods. The unpleasant bitter and acid flavour note and the undesirable burnt aroma note often found in badly cured products is a result of poor smoke generation control.

Practical application

Based upon the above physico-chemical criteria we established definite parameters for "hot" smoke-curing of fish, which allowed a considerable increase in the intensity of the smoking process.[15] The process must be carried out under carefully controlled conditions.

The fish smoking kiln designed by Hardy and Cutting,[16] consisting essentially of a drying chamber with an overhead recirculation, proved to be very well adapted to hot smoking along with physico-chemical criteria. The original experimental design with a volume of 2·40 m³ (84·75 cu. ft.) in the inner chamber was built in a laboratory size and with an inner volume of 0·43 m³ (15·18 cu. ft.) but according to all the original details and equipped with elec-



Smoking cycles based upon physico-chemical requirements.[15]

trical strip heaters on top. The smoke producer was of the Canadian design.[17]

The air and smoke speeds across the empty kiln were 3 m/sec., *i.e.* 594 ft./min. and fell after filling it with the product to 1 m/sec., *i.e.* 192 ft./min. over the fish.

The density of loading exceeded slightly the fill practised in common natural draught kilns with open fire at the bottom and amounted to 28-39·5 kg. of tentered Baltic herring or cod and 16·7 -18·5 of sprats per cu. metre of kiln volume (1·74-2·49 lb. respectively 1·04-1·15 lb. per cu. ft.).

Fresh fish was prepared before smoking by salting in a 20% brine in room temperature in a proportion of 1 part fish to 1 part of brine for 25 min. with smaller fish, to 110 min. with large-sized gutted cod.

Our preliminary experiments showed that it took 30 min. at 94°C. (201°F.) and 23-28 min. at 104°C. (219°F.) to reach the required inner temperature of 76°C. (167°F.) in herring tissues of 10-12 mm. thickness. With cod of 15 mm. thickness and a rising kiln temperature of 55-110°C. (131-230°F.) it takes 68 min., whereas 108 min. are required with larger cod of 25 mm. thickness.

The required partial drying and loss of 20% of the original weight was achieved with Baltic herring (length 22-26 cm.) at a kiln temperature of 60°C. (140°F.) after 37 min. and at 70°C. (158°F.) after 30 min., whereas at a temperature slowly rising from 25-80°C. (77-176°F.) it required a much longer time (57 min.).

The preliminary results confirm that with herring it takes 23-31 min. according to the size of the fish and 108 min. for cod in order to attain a sufficient thermal denaturation of the tissue to make it palatable and less watery.

Based upon the above findings a dynamic hot smoking process was developed for sprats, Baltic herring and cod, care being taken to avoid thermal quality injuries.

The total time of the process is considerably shorter than the traditional time schedule in the natural draught kilns with open fire hearths at the bottom: total time for sprats 50 min. instead of 65 min., and longer for herring, 70 min. instead of 155 min., and for cod, 100 min. instead of 170 min.

As can be seen from the graphs for herring and sprat, after a short surface drying of 10 min. at the beginning, hot smoking begins immediately. A smoke cure of around 50 min. is sufficient to produce a deep golden colour. Cod should not be smoked longer than 50-60 min. in order to avoid a dark, unattractive colour and a bitter taste.

When the relative humidity in the smoking chamber is high and the surface of the fish is wet, the amount of deposited smoke constituents in the fish increases considerably. The intensity of the acquired smoked fish colour is related to the amount of phenols deposited on the fish. But there is not always a direct relationship between the amount of deposited phenols and the brilliancy and desirability of the smoked fish colour. For example, judging different experimental lots of herring, the best samples with regard to colour contained 12·95, 24·36, 13·49 and 14·20 mg. of phenols in 100 g. of skin.

In flavour appraisals by the consumer acceptance method the highest ranking obtained samples with the following amount of phenols: 5·93, 3·92, 3·75, 6·29 and 5·75 mg. per 100 g. of smoked fish meat.[18]

Improvement in overall quality and keeping quality

When the hot smoking curing of fish is conducted according to the above method of process control, the overall quality and uniformity of the finished product is of the highest standard rarely found on the market. The improvement embraces the sight and colour of the smoked fish, which are most attractive, as well as a high tenderness and juiciness. The aroma is clean without any burned note and the flavour profile well blended and intense, free of undesirable notes. The keeping quality of the hot smoke-cured fish is greatly improved. Herring having a dry-out yield of 81% (fresh into the kiln = 100%) shows no detectable quality deterioration even after 10 days of ordinary storage in average room temperature con-

ditions (13-18°C., 59-64·4°F.) and plain paper packaging. The keeping quality is on the average three times longer when compared with the ordinary hot-smoked product found on the market. A similar improvement in the keeping quality showed other fish species.

Furthermore, the rationalisation of the hot smoking process increases the productivity of the commercial fish smoking enterprise by reducing both the time and the cost of production. Steam or electricity is used instead of wood logs for drying and heating, and only sawdust and "chips" serve for smoke production. The working conditions are also greatly improved.

Summary

Commercial hot-smoking procedure is largely empirical when conducted under uncontrollable, inconvenient and uneconomical conditions. In a rationalised process the internal meat temperature range should not exceed 76-82°C. (170-180°F.) sufficient to attain full palatability, and the partial drying of the product should be conducted in observance of this critical temperature. A sufficient hot-smoke cure introduces 4-6 mg. of phenols per 100 g. of meat implying at the same time an even, deep golden metallic colour on the surface. Based upon physico-chemical considerations definite parameters for three species of fish were elaborated, which greatly improve the quality and keeping value of the smoked product, as well as the productivity of the smoking plant.

REFERENCES

1. I. Tarnowska. Unpublished data, Politechnika Gdanska, 1954.
2. J. G. Sharp. Dehydrated Meat. Dep. Sci. Industr. Res., London, *Food Investig. Spec. Rep. No.* 57, 1953.
3. C. L. Cutting, G. A. Reay and J. M. Shewan. Dehydration of Fish. Dep. Sci. Industr. Res., London, *Food Investig. Spec. Rep. No.* 62, 1956.
4. F. W. Putnam. Denaturation of protein. Chapter in "The Proteins," by H. Heurath and K. Bailey, New York, 1953.
5. E. E. Rice and J. F. Beuk. The effects of heat upon the nutritive value of protein. *Adv. in Food Research*, IV, 1953.
6. Dept. Sci. Industr. Res., London, *Food Investig. Bd. Rep.*, 1952, 1953, 1954, 1955.
7. T. Jez. Unpublished data, Politechnika Gdańska, 1956.
8. E. P. Linton and H. V. French. *J. Fish Res. Bd. Can.*, 1945, **7**, 4, 338-348.
9. Z. Sikorski. *Przemysł Spożywczy*, 1956, **10**, 9, 370-373.
10. Z. Ziemba. *Gospodarka Mięsna*, 1956, **8**, 3, 7-12.
11. J. M. Shewan. *Chem. Ind.*, 1945, **64**, 13.
12. J. G. Schoonens. *Visserijwereld*, 1949, **8**, 1053/*Food Sci. Abs.*, 1951, 23, 561, 2293.
13. E. Psuty. Unpublished data, Politechnika Gdańska, 1956.
14. J. Petkiewicz. Unpublished data, Politechnika Gdańska, 1956.
15. D. J. Tilgner and M. Pietrzyk. *Przemysł Spożywczy*, 1956, **10**, 11, 461-464.
16. J. K. Hardy and C. L. Cutting. *British Patent* No. 544,229; also C. L. Cutting, *Food Inv. Leaflet No.* 10, H.M. Stat. Office, 1950.
17. J. S. H. Harrison and S. W. Roach. Fish. Res. Bd. Canada, *Prog. Rep. Pac. Coast Sta. No.* 76, 1948.
18. S. Rauscher. Unpublished data, Politechnika Gdańska, 1955.

Skuse's "Complete Confectioner"

THE long-awaited publication of the 13th edition* of this perennially useful reference book provides a welcome addition to the literature on the production of confectionery. The editors responsible for the revision of the book are to be congratulated on the modernised lay-out of the text, and the juxtaposition of metric equivalents of avoirdupois and liquid measures in each of the extensive formulations. This gives the book a universal appeal.

In the opening chapters devoted to brief descriptions of the raw materials used by the confectioner, emphasis has naturally been given to flavours and colours. This is extremely useful and in future editions might be enlarged since, in general, the confectioner has still a good deal to learn about the proper use of flavours and colours. The reader should study these particular chapters intensively and apply the expert advice to his work. In all books dealing with any subject there will be found at least a few ideas which, if applied, will result in profitable production, technically and financially. Therein lies the value of technical literature to the manufacturer.

The several references to the Food Standards Regulations (G.B.) governing nomenclature and certain raw materials and substances used in the confectionery industry, are particularly helpful. The wider scope of authoritative control increases the pitfalls besetting the path of the confectioner. He must, therefore, be conversant with the contents of the Orders mentioned in this book.

The presentation of the exhaustive collection of formulations follows the time-honoured pattern. They cover high-boiled sugar goods in all phases, toffees and caramels, fudges, marshmallow, nougat, paste goods, gums, pastilles and jellies, starch-filled confections, dragees, marzipan, fourres, chocolate, compressed tablets and a miscellany of ancillary confectionery products. The formulæ submitted in any technical book must, of course, be accepted by the reader as bases for experimentation. Allowances must be made for the varying conditions of production, atmospheric barometric and humidity variations, and the different cooking rates in factories. By bearing this in mind the practical value of written formulæ is increased. Confectioners may disagree with some of the minor suggestions mentioned, but they cannot disagree with the overall usefulness of the comprehensive coverage given by "Skuse."

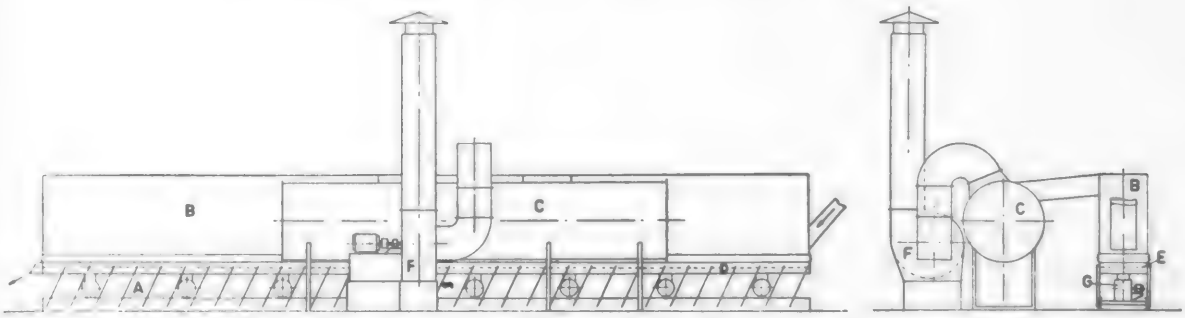
The methods of preparation of each formulation throughout the book are sufficiently detailed for the average confectioner to follow without his wondering what he does next. He will find considerable help in determining the amounts of flavour and colour by reference to the many comprehen-

(*Turn to page* 387)

* *Skuse's Complete Confectioner.* Revised and published by W. J. Bush and Co., Ltd. 13th Edn. 1957. Pp. 344. Illustrated. 30s. net.

New Sugar Dryer and Cooler

INSTALLATION IN A DUTCH SUGAR FACTORY



IN order to produce a freely running sugar, it must be packed dry and cool. If it is packed at a temperature higher than about 40°C. there is a tendency for lumps to form. For some time, therefore, the sugar factories have been looking for a simple means of bringing the centrifuged sugar down to this temperature.

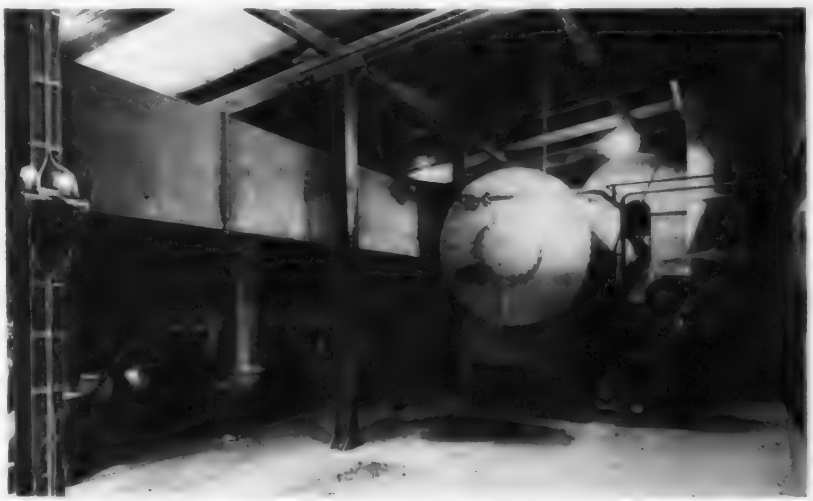
The grasshopper conveyor, or vibratory channel, used for carrying the sugar from the centrifuges to the bag-filling machines has sometimes been adapted for cooling and drying, and it is on these lines that a new machine has been designed by Werkspoor N.V. During the 1954/55 season a pilot plant was built alongside an existing conveyor in one of the Dutch sugar factories so that adjustments and improvements could be carried out without impeding normal production.

As a result of the experience thus gained a perfected dryer-cooler was installed for the 1955/56 campaign, which according to the sugar manufacturer's specifications had to be capable of dealing with about 18 tons of sugar per hr. It was required that steam-washed sugar discharged from the centrifuges be dried and cooled from 85°C. to 40°C. The available floor space was about 56 ft. × 16 ft., while the height of the installation was restricted to 11 ft. 6 in.

Operating throughout the 1955/56 and the 1956-57 campaigns, this new grasshopper-type machine is reported to have handled 18 tons of sugar per hr. very comfortably. As the sugar was apt to arrive in batches from the centrifuges, the rate of handling often exceeded the design capacity, even exceeding 25 tons per hr. without the temperature of the finished product rising above 40°C. The lower quality sugar produced on the last day of the campaign was also fed into the dryer-cooler, and it is claimed that even this was considerably dryer than usual and could be easily bagged.

The installation (see diagram) consists primarily of the grasshopper chute A, the air hood B and the dust catcher C. The container D of the grasshopper chute is divided into two horizontal parts by specially designed louvres E giving a top and bottom section. Through the top section the sugar is transported over the louvres, while air is blown into the bottom section by a number of small fans G, which are mounted in the support of the grasshopper chute. By way of the louvres, the air is forced through the layer of sugar as it travels over them between the centrifuge discharge and the bagging apparatus. Depending on whether the sugar is processed in the centrifuges by washing with water or washing with steam, heat may be required to dry the sugar in the early stages of its passage through the grasshopper chute and some of the small fans in this section can be furnished with heaters. The sugar is then cooled by cold air in the second stage of its passage through the chute. To this end, the space be-

(Turn to page 387)



The new Werkspoor sugar dryer cooler.

NISIN in Food Technology—1

By H. B. Hawley*

Nisin, an inhibitory metabolite produced by a cheese-starter organism, is the first antibiotic substance to be accepted by many countries for the control of certain types of bacterial spoilage. Below we publish the first part of a comprehensive survey of its discovery, its properties and its uses in a wide variety of foodstuffs. In Part 1 of this survey the author deals with the current use of nisin in natural and processed cheeses and discusses some of its potential applications in canned goods.

NISIN is an inhibitory substance which is produced by a number of strains of the cheese-starter organism *Streptococcus lactis*, and cheeses in which it occurs naturally are not prone to certain bacterial defects. This property can be exploited by using these strains of *Str. lactis*, or the inhibitory principle itself in the manufacture of other types of cheese and in cheese processing.

Since this substance inhibits *Clostridia* (anærobic spore-bearing bacteria) and certain other spoilage bacteria, it has applications in other fields of food handling, manufacture and processing, particularly in canning and pickling. It is valuable as a supplement to various established methods of food preservation, but it is not a substitute for them. Canned foods must always be rendered safe against *Clostridium botulinum* by the traditional methods of processing. Unfortunately, such treatment may not make the product sterile, and the use of nisin is therefore a valuable additional safeguard.

Properties of nisin

The inhibitory effects of certain strains of *Streptococcus lactis* when used with *Lactobacillus bulgaricus* in the preparation of Yoghourt was first noted by Rogers in 1928.[1] Later Whitehead and Riddet[2] in New Zealand observed the existence of an inhibitory substance during an investigation of the behaviour of the mixed strains of lactic streptococci used in cheese starters. Whitehead[3] subsequently succeeded in concentrating and partially characterising it. In England, Meanwell[4] isolated similar lactic streptococci from farm milk and dairy farm equipment. Mattick and Hirsch[5] eventually isolated and studied this inhibitory substance, which they named "nisin." More detailed investigations were made by Hirsch,[6, 7] Berridge,[8, 9, 10] Berridge, Newton and Abraham[11] and Lilley.[12] The therapeutic potentialities of nisin have been investigated by Gowans, Smith and Florey,[13] who concluded that it was of little or no medical value, especially in view of the fact that adequate therapeutic levels of nisin are soluble only in aqueous solutions at *p*H 2 or lower.

Nisin is a metabolite of certain group-N lactic streptococci, the natural habitat of which is milk and the products of its fermentation such as cheese and Yoghourt-like drinks. It is a large polypeptide or small protein with a molecular weight of approximately 10,000, and consists of five polypeptide components with slightly different physical, chemical and biological properties.[8, 9, 11]

Nisin is inhibitory to various species and strains of the genera *Staphylococcus, Streptococcus, Neisseria, Bacillus, Clostridium, Corynebacterium*. Pure nisin was believed by Berridge[8] to contain approximately 50×10^6 Reading units per gram, but recent work in the research division of Aplin & Barrett, Ltd., indicates an activity of 40×10^6 R.u./g. On this basis the titre of nisin required to inhibit the organisms listed ranges from 0·25 to 500 units (0·006 μg. to 12 μg.) per gram of substrate.

Precise quantitative data on the solubility of nisin is not yet available, since this depends on the *p*H and the nature of the substrate. At *p*H 7 in water the solubility is in the neighbourhood of 75 μg./ml., but it increases rapidly as the *p*H is lowered, being 1,000 μg./ml. at *p*H 5·6 and 12,000 μg./ml. at *p*H 4·2. The presence of protein in the substrate apparently increases the solubility on account of adsorption effects without any loss in activity. Crystalline nisin and high-titre preparations are most readily dissolved in 0·02 M. hydrochloric acid. In practice, it may safely be assumed that the solubility of nisin is adequate for all its potential applications to food technology.

In the dry state crystalline nisin and high-titre preparations may be stored at room temperature for at least several years, and probably indefinitely. In solution, however, the stability of nisin depends on the *p*H, temperature and nature of the substrate. Rapid inactivation occurs in alkaline solution, but under some conditions this is reversible. In most practical applications it is preferable not to exceed *p*H 6·5, although in view of the protective effect of many substrates, the stability is best determined under requisite conditions. As an example, an aqueous substrate containing 3% protein and 50 μg./ml. nisin when heated at 100°C. required for complete inactivation of the nisin, 2 hr. at *p*H 8, 1 hr. at *p*H 9 and 30 min. at *p*H 10. Between *p*H 2 and *p*H 6 there was no loss during 30 min. heating at 100°C., and only 25% loss at *p*H 6 after 1 hr.[12] Little loss of activity occurs on heating nisin preparations in processed cheese at 80-95°C. during the normal cooking time.

Pharmacological and health aspects

Nisin is of a proteinaceous nature and does not contain any

* Director and Director of Research, Aplin & Barrett, Ltd.

amino-acids of abnormal physiological configuration (D-series). It is partially inactivated by ptyalin and is digested by trypsin. Its maximum stability is in the range *p*H 2 to *p*H 4, and it is almost insoluble in water except in the neighbourhood of *p*H 2. Thus, nisin is not of medical interest and consequently problems of sensitisation and antibiotic resistance do not arise from its presence in foodstuffs.

A number of toxicity studies have been made, and recently a systematic investigation has been carried out on the acute and subacute toxicity of nisin and on a cheese containing nisin produced naturally by a strain of *Str. lactis* used as the starter organism. All these investigations show that nisin is harmless.[13, 14, 15] Tests made by Frazer and Hickman were carried out on albino rats, and they conclude:

> "It has been shown that nisin is a harmless substance even when fed in large daily doses over a period of three months. It has been shown to have no lethal, or indeed any observable deleterious effects when given at 20,000 times and 40,000 times the standard dietary dose, assuming this to be of the order of 25 units/kg. body weight/day, of nisin."

Work in progress in the Research Division of Aplin & Barrett, Ltd., shows that the nisin-resistant bacteria examined are not cross-resistant to the medical antibiotics. Consequently, there is no danger that the use of nisin would militate against the therapeutic effectiveness of the medical antibiotics.

The sensitivity of nisin to ptyalin, its digestion by trypsin, its destruction by yeasts,[16] by certain lactobacilli[17] and by many lactic streptococci,[18] its relatively narrow spectrum and the insensitivity of most Gram-negative bacteria, and also its instability in the vicinity of *p*H 7 make it unlikely that it could have any effect on intestinal flora. This is borne out by experiments on pigs[19] and on poultry.[20]

There is also evidence that nisin is not foreign to the human alimentary tract since nisin-producing strains of *Str. lactis* have been isolated from the human throat and from stools.[21] They are quite common in naturally soured milk and on milking equipment.[4]

USES OF NISIN

Processed cheese

At present nisin is being used in many countries in the manufacture of processed cheese and cheese spreads.

Processed cheese manufactured under properly controlled conditions contains only the spores of ærobic and anærobic bacilli derived from the original cheese, but as a result of many circumstances outside the control of the cheese processor bacterial deterioration may follow germination of these spores.

The processing and packaging of the pasteurised cheese renders the product fairly anærobic, and in consequence the Eh (oxidation-reduction potential) is usually too low for the ærobic spores to germinate and multiply. Unfortunately, these conditions are ideal for the germination of the anærobic (clostridial) spores, and pasteurisation often provides the requisite degree of "heat-shock" to encourage germination. Arising from these circumstances, processed cheese may contain clostridia in practically pure culture.

Writing a book?

The publishers of FOOD MANUFACTURE invite the submission of manusc ripts of books to be considered for publication. All manuscripts will be promptly acknowledged and carefully considered by qualified experts. A synopsis with chapter headings should be sent in the first instance to The Manager, Leonard Hill (Books) Limited Stratford House, Eden Street, London, N.W.1. Leonard Hill are specialists in industrial, technical and scientific books, and have a world-wide selling and distributing organisation.

The multiplication of clostridia in processed cheese often results in the formation of gas holes leading to blowing or inflation. This is a serious defect and heavy losses can be incurred. Blowing is not an inevitable consequence of clostridial growth since this depends on whether the metabolic reaction is homo- or hetero-fermentative. In some instances, putrefaction without gas production occurs, whilst in other cases there may be no very obvious organoleptic changes. Quite apart from the economic losses which may be incurred as a result of clostridia, their presence in processed cheese is objectionable on æsthetic and health grounds. It should also be borne in mind that many of the clostridia found in processed cheese are potentially toxigenic strains.[22]

Various attempts have been made to destroy the clostridial spores in processed cheese or to discourage clostridial prolification. Cheese-cookers have been developed in which the processing can be carried out at temperatures of 105°C. or higher, but these temperatures have not proved satisfactory in destroying bacterial spores within practicable cooking times because of the protective effect of butterfat and protein. A serious objection to this process is the heat damage to the body and flavour of the cheese as well as damage to the milk protein, particularly the destruction of lysine, by the Maillard reaction.[23]

A reduction in *p*H and an increase in the salt content of processed cheese has been tried as a further means of control, but with little success.[24] A sufficiently low *p*H seriously impairs the quality and causes great processing difficulties; a high salt content makes the cheese unacceptable.

Attempts have been made to render conditions unfavourable for the clostridia by the addition of oxidising agents such as perphosphates, bromates, chlorates, chlorites, nitrates, in order to raise the Eh. Such additions are precluded by the preservatives regulations of most countries, and there is always the possible hazard of toxic complexes being formed

(*c.f.* methionine sulphoximide in agenized flour). The use of such additions may control clostridia, but the higher Eh encourages the growth of ærobic spore-bearers. In these circumstances, various undesirable changes can take place, such as proteolysis and "wheying-off," and occasionally blowing due to *Bacillus polymyxa* or related strains.[25] The ærobic sporeformers have also been implicated in various outbreaks of food poisoning. Suspicion particularly centres round *B. cereus*,[26] which is quite a common organism in processed cheese which has been rendered ærobic.

The clostridial deterioration of processed cheese and cheese spreads is a world-wide problem. The trouble is irregular and erratic, but in spite of numerous laboratory check procedures the manufacturer is frequently unable to ascertain the propensity to blow prior to distribution. Consequently, there is potential risk to the public, damage to the manufacturer's reputation and the liability to prosecution for purveying unwholesome food with the attendant risk of claims for damages.

Numerous workers have demonstrated that these troubles can be eliminated by the use of nisin, and wholesome, highly acceptable and biologically stable processed cheese is being manufactured by this method.[16, 17, 27-31] These observations have now received ample confirmation from manufacturing experience in the use of nisin during the past few years.

The use of nisin in processed cheese does not enable the manufacturer to process decomposed or unwholesome cheese, since it is not possible to produce a satisfactory product with such cheese; also if the processing and packaging are unhygienic, the nisin is often destroyed by the contaminating mesophilic bacteria.[18, 32]

Original cheese

The potentialities of nisin are attracting much attention in the manufacture of many Continental types of cheese, particularly the low-acid sweet cheeses such as Emmental, Gruyère, Edam, Gouda, Samsoe, Danish-Swiss, Tilsit, Limburger and also the hard cheeses, Parmesan and Grana.

All these types of cheese are very susceptible to clostridial blowing or other forms of clostridial deterioration, partly because of the lactose they retain and their relatively high *p*H. Heavy losses may be incurred, and these have been accepted in the past as inherent in the process. Numerous workers have shown that nisin can mitigate these defects,[17, 18, 27, 30, 33-37] and Edam containing nisin is now being produced commercially in Holland.

There is, as yet, no large-scale application because of various technical difficulties of varying magnitude depending on the type of cheese, but experimental work is in progress in France, Holland, Denmark, Austria, Norway, Sweden, Italy, Spain and Greece. Nevertheless, steady progress is being made as knowledge of the ecological inter-relationships of the micro-flora of cheese grows.

Parmesan cheese is particularly susceptible to clostridial deterioration,[38] and serious economic losses may be incurred, particularly in view of the long period of maturing and the relatively high incidence of defects occurring as late as twelve to eighteen months after manufacture. The addition of formaldehyde during manufacture appears to be widely practised as a means of mitigating some of these defects, but its use is widely regarded as undesirable if not positively dangerous. If nisin is capable of providing the answer to these problems, its adoption would make a vast difference to the Parmesan and Grana cheese industry. Work is in progress in the research division of Aplin & Barrett, Ltd., and the preliminary results are encouraging, but the long storage of these cheeses necessitates tests over protracted periods since it would be unwise to draw any hasty conclusions. Similar investigations have recently been commenced in Italy.

Recently, crystalline nisin and various high-titre preparations have become available commercially and nisin-resistant strains of various lactobacilli concerned in the ripening of cheese have been developed in the research division of Aplin & Barrett, Ltd. These developments may obviate many of the disadvantages of nisin-producing starters by allowing the incorporation of nisin at later stages in the manufacture of the cheese. By this means it may prove possible to use ordinary starters in the early stages of production, the nisin being added when full acid development and curd-formation has occurred. The inclusion of additional cultures of nisin-resistant lactobacilli with the starters, or subsequently, should ensure continuity of acidification during ripening.

Canned foods

Adequately heat-processed canned vegetables and meat packs which are regarded as commercially sterile may contain spore-bearing rods or their spores.[39] This is due to the extreme heat-resistance of certain of these organisms and the impossibility of using sufficiently high processing temperatures without incurring damage to the products. For example, Weinzirl[40] examined 782 normal cans of fruit, vegetables, meat and milk and found that 179, or 23%, contained viable organisms, of which spore-bearing rods formed almost the only type. Non-spore-bearing organisms were attributable to faulty seams. A similar investigation by Cheyney[41] revealed 8% non-sterile cans in his series of 725 cans after incubation at 37°C. for ten days. The only bacteria isolated were spore-bearing rods, except in the case of two cans with defective seams, which contained staphylococci.

The spore-bearing rods commonly occurring in such cans are *Bacillus stearothermophilus*[42] and related strains, which cause "flat-sour" spoilage by producing acid without gas, and *Clostridium thermosaccharolyticum*,[43] which gives rise to "hard swells" due to gaseous fermentations. Considerable spoilage may occur when packs infected with these organisms or related strains are exported

to hot climates or stored in the warm parts of cargo-ships. Spoilage may also arise if the cans are not cooled quickly after processing.

Damage and loss as a result of "flat-sours" and "hard swells" present a world-wide problem on which there is an extensive literature.[44-52] Such spoilage is particularly serious in wartime, since in the case of canned foodstuffs supplied to the armed forces no restrictions can be placed on storage, and soundness must be guaranteed under all climatic conditions.

Since nisin inhibits *Clostridia* and certain other spoilage bacteria, it has applications in many fields of food-processing, particularly in canning and pickling. It is proposed only as a supplement to certain established methods of food preservation and not as a substitute for them. It is not suggested that it should be used for the purpose of reducing the heat-treatment of canned foods which must be rendered safe against *Clostridium botulinum*.

Nisin has not yet been used on a commercial scale in canning, but encouraging laboratory data has been obtained. Its application in the canning of vegetables has been under experimental investigation at the Fruit and Vegetable Canning and Quick Freezing Research Association, Chipping Campden, Gloucestershire, England, during the past three years; work is also in progress at the Western Utilisation Research Branch, Agricultural Research Service of the United States Department of Agriculture.[53, 54, 55] A considerable amount of work is also going on in various commercial establishments.

It would appear that nisin will have the greatest application as a supplement to the normal processing schedules as a means of controlling spoilage by organisms resisting normal heat treatment. On the other hand, it may prove possible to reduce the thermal processing of certain heat-labile products, since it has been shown that nisin reduces the thermal resistance of certain spores.[54, 55] It should be noted that nisin is not active against most mesophiles encountered in canning, and spoilage would thus occur in the event of serious under processing. Bacteria may occasionally enter cans through faulty seams when they are cooled in contaminated water,[56, 57, 58] but nisin has no effect on the bacteria encountered under these circumstances and the manufacturer consequently obtains no protection against faulty techniques.

Vegetables and tomato products

The commonest forms of spoilage in canned vegetables are flat-souring caused by the facultative anærobes typified by *Bacillus stearothermophilus* and the hard swells due to *Clostridium thermosaccharolyticum* and related strains. The work carried out at Chipping Campden, England, has clearly shown that nisin effects complete control of these micro-organisms.[56] Its use should therefore eliminate a serious source of spoilage of many types of canned vegetables.

Canned beans with tomato sauce are fairly commonly spoiled by hard swells due to *Cl. thermosaccharolyticum*, which often comes from the tomato paste used.[59] Flat-sour spoilage is probably more common in canned peas although *B. stearothermophilus* may be present without causing spoilage in temperate climates.[60]

Cl. thermofermentans has been shown to be a cause of spoilage in canned egg-plant,[61] and *Cl. butyricum* is a cause of spoilage in canned beans, peas, potatoes and tomato products.[62] The effect of nisin in the control of these defects has not yet been investigated, but there is no reason to think that it would not prove effective.

Sugar is sometimes used in vegetable canning, for example in the brine with canned peas, and unless special grades are available it can be a source of mesophilic and thermophilic clostridia. High counts of thermophilic spores have been reported by British,[63] Dutch[64] and American[65] workers, who also found high counts of the spores of *B. stearothermophilus*. The mesophilic anærobes, *Cl. sporogenes* and *Cl. putrificum* were detected in 85% of the 33 samples of sugar examined by Weinzirl.[66]

Although, strictly speaking, tomatoes are classed as berries, it may be more appropriate to consider canned tomatoes in this section. Various types of spoilage bacteria have been isolated from canned tomatoes, tomato paste and tomato juice and different types of deterioration have been described. The spore-bearing rods isolated include *Cl. pasteurianum*, which will grow down to *p*H 3·55, *Cl. thermosaccharolyticum*,[67, 68] *B. thermoacidurans*[59, 69] and *Cl. butyricum*.[70, 71]

Canned tomato products can carry a heavy load of spore-bearing spoilage bacteria, which frequently cause trouble in packs containing tomato, such as beans with tomato sauce,[59] sardines or pilchards with tomato sauce and sandwich spreads. Tomato containing packs are also very susceptible to heat damage, so that it is desirable to keep heat-processing down to the absolute minimum consistent with safety. In view of this, nisin should have an important place in this field of food technology.

Fruit

Since yeasts and moulds are not sensitive to nisin, it has a somewhat more restricted application in fruit and fruit juice processing because the *p*H of these products is generally unfavourable to microbial spoilage. Canned pears and pineapple are, however, particularly susceptible to fermentation by butyric acid bacteria. *Cl. pasteurianum* will flourish at a *p*H below that desirable for high quality packs since too low a value causes maceration of the fruit and this organism will grow in fruit juices down to *p*H 3·55.[67, 72] Off-flavours and souring can be caused by the flat-sour ærobe, *Bacillus thermoacidurans*, which grows actively at *p*H 4 and shows slight growth at *p*H 3. Another spore-bearing ærobe causing spoilage in canned fruit is *Ærobacillus macerans* (*B. macerans*), which flourishes in the range *p*H 3·8-4·0.

Meats

The application of nisin to the bacteriological problems of meat and meat-products processing opens up many attractive possibilities, since normal heat-treatment, although adequate to ensure a botulinum kill, may not be sufficient to achieve sterility. This is often the case with products incorporating spices, condiments, various cereal fillers and soya,[73] which may harbour large numbers of thermophilic spore-bearing bacteria. Meat extracts are also a prolific source of thermophiles.[74] Mossel[49] has drawn attention to the presence of clostridia in many of the ingredients used in meat canning as fillers and condiments; spices, starches and cereals may be prolific sources of mesophilic and thermophilic clostridia, milk powder may be a source of various clostridia. *Cl. perfringens, Cl. butyricum* and *Cl. sporogenes* were detected in 14% of a series of 671 samples of milk powder examined by Crossley and Johnson.[75] Milk powder may also be an abundant source of thermophiles.

Ruyle and Tanner[76] examined 559 normal cans and reported that 31, or 5·5%, were unsterile. The bacterial types isolated were as follows: obligate anærobes, 2; sporing ærobes, 17; facultative thermophiles, 1; non-sporing rods, 9; and micrococci, 15. In a similar investigation Crossley[77] examined 14,365 apparently sound jars of potted meats and fish pastes from various sources. Spore-bearing ærobes or anærobes were isolated from 12·1% of these samples. Spoilage in meat and fish pastes was generally caused by *Cl. sporogenes* and *Cl. putrificum*, but other organisms, including *Cl. welchii*, were isolated; in canned meats Crossley[62] found that *Cl. sporogenes* is probably the cause of the most serious spoilage.

Most of these defects are amenable to effective control by nisin, as in the case of processed cheese, although the problem is much simpler in the case of these products because the spoilage bacteria often occur in pure culture, or at least free from mesophilic contaminants, whereas in processed cheese the flora after packaging may be predominantly mesophilic.

Fish and crustaceans

The bacteriological picture is much the same as with canned meats, and spoilage is attributable mainly to thermophilic clostridia and facultative anærobes. Nevertheless, mesophilic clostridia occur much more frequently in canned fish products than in canned meat products. A bacteriological investigation by Crossley[77] of the ingredients of potted pastes showed that a significant proportion of the canned tomalley, canned sardines or canned shellfish examined was not sterile and many contained clostridia, mainly *Cl. butyricum* and *Cl. welchii*, occasionally *Cl. putrificum* and *Cl. sporogenes*. This investigation showed that 30% of all samples of canned salmon contained spores of ærobes and anærobes. On the other hand, Fellers,[78] in his series of 5,276 cans of salmon of normal commercial quality, found that 3·4% were unsterile. It is interesting to note that more than 50% of the bacilli isolated were facultative anærobes. Neither of these investigators make, any reference to the presence of strict or facultative thermophiles, although Jarvis[79] states that the incidence of flat-sour spoilage in canned fishery products is high. In some cases this is attributable to the inclusion of such fillers as potato and dried egg powder, which may be heavily infected with *Cl. thermosaccharolyticum* or related strains.[51]

The judicious use of nisin would not only eliminate most of the bacterial defects discussed but it would also greatly diminish the spoilage and potential spoilage arising when these products are incorporated in other processed food packs.

Soups

A great variety of materials may enter into the formulation of soups, and the spices and other condiments, cereals and milk may be heavily infected with mesophilic and thermophilic spore-bearing bacteria. The bacteriological condition of some of the ingredients has already been discussed under the section on Meats. Thermophiles are particularly troublesome in soups and may cause "hard swells" or "flat-souring," often with protein coagulation.

Milk and milk powder may cause serious contamination of cream soups with thermophiles, and there is a very extensive literature on the subject[80, 81, 82] which testifies to the importance of this aspect and to the losses which can be incurred.

There is now evidence that nisin at a concentration of a few parts per million in canned soups should prove effective with almost every formulation of ingredients in eliminating spoilage due to "flat-sours" and "hard swells."

Evaporated milk and milk foods

Properly manufactured evaporated milk may not be sterile, but it should contain only the spores of the more heat resistant bacilli and clostridia. Spoilage due to non-sporing bacteria has been reported, but in these cases defects were due either to faulty heat-treatment or defective cans and need not be considered further. According to published reports spoilage appears to be due commonly to ærobic spore-formers, the species being *B. subtilis, B. cereus, B. coagulans, B. megatherium, B. calidolactis*, with optimum growth temperatures ranging from 28°C. to 65°C.[83] Some of these organisms cause sweet curdling or bitterness, others cause flat-sours. At present, there is not sufficient information available concerning the sensitivity of all these bacilli to nisin, although there is little doubt that much of the flat-sour spoilage could be prevented. It is interesting, however, to note that Campbell and O'Brien[54] have demonstrated that nisin reduces the thermal resistance of certain spores, among them is *B. coagulans*. Nisin should also eliminate defects caused by anærobes such as *Plectridium fœtidum* (*Cl. sporogenes*) and *Cl. putrificum*,[84] the spores of which are resistant to the

heat-treatments normally used in evaporated milk manufacture.

Canned milk puddings such as creamed rice puddings are products which would benefit from the use of nisin, since both milk and rice may have high thermophile counts. Flat-souring and hard swells can be a serious source of trouble with larger packs of such products.

In Part 2 of this survey, to be published later, an account will be given of the possible uses of nisin in the preparation of other classes of foodstuffs and in minimising the danger of outbreaks of food poisoning.

REFERENCES

1. L. A. Rogers. *J. Bact.*, 1928, **16**, 321. The inhibiting effect of *Streptococcus lactis* on *Lactobacillus bulgaricus*.
2. H. R. Whitehead and W. Riddet. *N.Z. J. Agric.*, 1933, **46**, 225. Slow development of acidity in cheese manufacture.
3. H. R. Whitehead. *Biochem. J.*, 1933. **27**, 1792. A substance inhibiting bacterial growth produced by certain strains of lactic streptococci.
4. L. J. Meanwell. *Proc. Soc. Agric. Bact.* (*abstr.*), 1943, 19. The influence of raw milk quality on "slowness" in cheese-making.
5. A. T. R. Mattick and A. Hirsch. *Lancet*, 1947, ii, 5. Further observations on an inhibitory substance (nisin) from lactic streptococci.
6. A. Hirsch. *J. gen. Microbiol.*, 1950, **4**, 70. The assay of the antibiotic nisin.
7. A. Hirsch. *J. gen. Microbiol.*, 1951, **5**, 208. Growth and nisin production of a strain of *Streptococcus lactis*.
8. N. J. Berridge. *Biochem. J.*, 1949, **45**, 486. Preparation of the antibiotic nisin.
9. N. J. Berridge. *Nature, Lond.*, 1952, **169**, 707. Counter-current distribution of nisins.
10. N. J. Berridge. *Chem. and Ind.*, 1953, 1158. The antibiotic nisin and its use in the making and processing of cheese.
11. N. J. Berridge, G. G. F. Newton and E. P. Abraham. *Biochem. J.*, 1952, **52**, 529. Purification and nature of the antibiotic nisin.
12. M. D. Lilley. Thesis (for the degree of Master of Science). University of Manchester, England. 1956. The isolation of the antibiotic nisin.
13. J. L. Gowans, N. Smith and H. W. Florey. *Brit. J. Pharmacol*, 1952, **7**, 438. Some properties of nisin.
14. A. C. Frazer and R. Hickman. *Confid. rep.* Res. Div. Aplin Barrett, Ltd., pp. 4 (mimeogr.). England: Aplin and Barrett, Ltd. 1956. Biological effects of feeding nisin and nisin cheese.
15. K. Schreier. Kleines Gutachten einige Versuche mit Nisin. Priv. com. to Firma Joh. A. Benckiser, Ludwigshafen - am - Rhein from Priv.-Doz. Dr. Med. K. Schreier, Universitäts-Kinderklinik, Heidelberg, Germany. 1956. Dated 27.10.56.
16. H. B. Hawley. *J. appl. Bact.*, 1955, **18**, 388. The development and use of nisin
17. J. W. Pette and J. S. Kooy. *Proc. 13th Intern. Dairy Congr., The Hague*, 1953, **3**, 1172. The inhibition of butyric acid fermentation in cheese by antibiotic producing starter.
18. T. E. Galesloot. *Ned. Melk-en Zuiveltijd.*, 1956, **10**, 143. Melkzuurbacterien die het Antibioticum van S. lactis (Nisine) onwerkzaam maken.
19. R. S. Barber, R. Braude and A. Hirsch. *Nature, Lond.*, 1952, **169**, 200. Growth of pigs given skim milk soured with nisin-producing streptococci.
20. M. E. Coates, G. F. Harrison, S. K. Kon, M. E. Mann and C. D. Rose. *Biochem. J.*, 1951, **48**, xii. Effect of antibiotics and vitamin B_{12} on the growth of normal and "animal protein factor" deficient chicks.
21. A. Hirsch and D. M. Wheater. *J. Dairy Res.*, 1951, **18**, 193. The production of antibiotics by streptococci.
22. W. E. Van Heyningen. Bacterial Toxins, 1st ed., pp. 133. Oxford: Blackwell Scientific Publications. 1950.
23. Committee on Protein Foods. Nat. Res. Coun. (Food and Nutr. Bd.) Rep. and Circ. Ser. No. 131 (Washington), 1950. The problem of heat injury to dietary protein.
24. E. G. Hood and K. N. Smith. *Sci. Agric.*, 1951, **31**, 530. Bacterial spoilage in processed cheese.
25. H. B. Hawley. *J. appl. Bact.*, 1956, **19** (2), v. Some investigations on bacterial deterioration in processed cheese.
26. S. Hauge. *J. appl. Bact.*, 1955, **18**, 591. Food poisoning caused by aerobic spore-forming bacilli.
27. A. G. Bylund, O. Norrgren and G. Sjöström. *Svenska Mejeritidnmgen*, 1954, **46** (31), 433; (32), 447. Användring av antibiotika-producerande Streptococcus lactis-stammen som meder mot smörsyrajasning i Ost. En orienterande undersokning.
28. M. Hietaranta and J. Heitinheimo. *Meijeritieteelinen Aikatauskirja*, 1953, **15**, 52. Über die Einwirkung der Erhitzung auf die Germination der Clostridiensporen.
29. A. Hirsch and E. Grinsted. *J. Dairy Res.*, 1954, **21**, 101. Methods for the growth and enumeration of anaerobic spore-formers from cheese, with observations on the effect of nisin.
30. J. S. Kooy and J. W. Pette. *Ned Melk- en Zuiveltijd*, 1952, **6**, 317. Het toepassen van antibiotica afscherdende melkzuurstreptococcen als zurrsel bij het tegengaan van boterzuurgisting in Kaas.
31. M. McClintock, L. Serres, J. J. Marzolf, A. Hirsch and G. Mocquot. *J. Dairy Res.*, 1952, **19**, 187. Action inhibitrice des streptocoques producteurs de nisine sur le développement des sporulés anaérobies dans le fromage de Gruyère fondu.
32. Aplin Barrett, Ltd. Res. Div. Memo., pp. 8 (mimeogr.), 1955. England: Aplin Barrett, Ltd. Technical data concerning nisin and its use in processed cheese.
33. J. Csiszar and G. Pulay. *Proc. 14th Intern. Dairy Congr., Rome*, 1956, **2** (2), 423. Untersuchungen mit, gegen Clostridien wirkungen Antibiotica bildenden *Str. lactis* Stämmen. I. Das Wirkungsspektrum der Antibiotica bildenden Stämme und die Steigerung ihrer Antibioticaproduktion.
34. A. Hirsch, E. Grinsted, H. R. Chapman and A. T. R. Mattick. *J. Dairy Res.*, 1951, **18**, 205. A note on the inhibition of an anaerobic spore-former in Swiss-type cheese by a nisin-producing streptococcus.
35. G. Pulay, L. Harmet and I. Nemet. *Elelmezési Ipar*, 1956, **10**, 40. Kisérletek a sajtok vajsavas puffádásának meggátlására. I. Vizsgálatok nizinszerü antibiotikumokkal.
36. G. Pulay. *Proc. 14th Intern. Dairy Congr., Rome*, 1956, **2** (2), 432. Untersuchungen mit, gegen Clostridien wirkungen Antibiotica bildenden *Str. lactis* Stämmen II. Über einige auf die Käsequalität ausgeübten ungünstigen Einflüsse der nisinartigen Antibiotica.
37. J. M. Rosell and D. S. Matallana. *Proc. 14th Intern. Dairy Congr., Rome*, 1956, **2** (2), 479. Resultats des cultures productrices de nisine dans le traitement preventif de la fermentation butyrique en fromagerie.
38. E. Savini. Il formaggio di Grana. 2nd ed. Inst. Sperim. di Caseificio Lodi, pp. 56. Lodi: Modena. 1947.
39. J. G. Baumgartner. Canned Foods. An introduction to their microbiology. 3rd ed., p. 203. London: Churchill. 1949.
40. J. Weinzirl. *J. Med. Res.*, 1919, **39**, 349. The bacteriology of canned foods.
41. E. W. Cheyney. *J. Med. Res.*, 1919, **40**, 177. A study of the micro-organisms found in merchantable canned goods.
42. P. J. Donk. *J. Bact.*, 1920, **5**, 373. A highly resistant thermophilic organism.
43. L. S. McClung. *J. Bact.*, 1935, **29**, 189. Studies on anaerobic Bacteria. IV. Taxonomy of cultures of a thermophilic species causing "swells" of canned foods.
44. T. E. Bashford. *Food Manuf.*, 1945 (Sept.), 313. Hygiene and canning practice.
45. T. E. Bashford. *J. Roy. San. Inst.*, 1947, **67**, 1. Discussions on the microbiological aspects of food quality. (a) Microbiology in relation to quality of canned foods.
46. W. D. Bigelow and J. R. Esty. *J. infect. Dis.*, 1920, **27**, 602. The thermal death point in relation to time of typical thermophilic organisms.
47. R. Buttiaux and H. Beerens. *J. appl. Bact.*, 1955, **18**, 581. Gas-producing mesophilic clostridia in canned meats, with improved techniques for their identification.

48. E. J. Cameron and J. R. Esty. *J. infect. Dis.*, 1926, **39**, 89. The examination of spoiled canned foods. 2. Classification of flat sour, spoilage organisms from non-acid foods.
49. D. A. A. Mossel. *Ann. Inst. Pasteur, Lille*, 1955, **7**, 171. The importance of the bacteriological conditions of ingredients used as minor components in some canned meat products.
50. H. J. Pappas and L. A. Hall. *Food Tech.*, 1952, **6**, 456. The control of thermophilic bacteria.
51. Y. Tōyama and Z. Nakajima. *Bull. Jap. Soc. Sci. Fish*, 1950, **16**, 53. Studies on the thermophilic bacteria causing "swells" of canned fish.
52. O. B. Williams and A. D. Hennessee. *Food Res.*, 1956, **21**, 115. Studies on heat resistances. VII. The effect of phosphate on the apparent heat resistance of spores of *Bacillus stearothermophilus*.
53. J. C. Lewis, H. D. Michener, C. R. Stumbo and D. S. Titus. *Agric. Food Chem.*, 1954, **2**, 298. Antibiotics in food processing. Additives accelerating death of spores by moist heat.
54. L. L. Campbell and R. T. O'Brien *Food Tech.*, 1955, **9**, 461. Antibiotics in food preservation.
55. R. T. O'Brien, D. S. Titus, K. A. Devlin, C. R. Stumbo and J. C. Lewis. *Food Technol.*, 1956, **10**, 352. Antibiotics in food preservation. II. Further studies on the influence of subtilin and nisin on the thermal resistance of food spoilage bacteria.
56. T. G. Gillespie. Priv. com., 1956. Nisin trials with canned beans in tomato sauce and canned garden peas. (Draft report.)
57. G. W. Blackwood and W. A. Kalber. *Canner*, 1943, **97**, 28. Effects of abuse as shown by contaminated cooling water.
58. T. E. Bashford. *Proc. Soc. Appl. Bact.*, 1947, **10**, 46. Infected cooling water and its effect on spoilage in canned foods.
59. T. G. Gillespie and G. Kenny. Fruit Veg. Cann. Quick Freez. Res. Assoc., Tech. Memo. 18, 1957. England: Chipping Campden. Thermophilic anaerobe spoilage in beans in tomato sauce traced to infected tomato paste.
60. F. Hirst. Ann. Rep. Fruit and Veg. Preserv. Res. Sta., 1931-32, p. 65. Chipping Campden, England.
61. I. L. Tidel'skaya. *Mikrobiol. Zh., Akad. Nauk, U.S.S.R.*, 1939, **6**, 175. A new anaerobic thermophilic species, Cl. thermofermentans (n. sp.).
62. E. L. Crossley. *J. Soc. Chem. Ind.*, 1941, **60**, 131. The routine detection of certain spore-forming anaerobic bacteria in canned foods.
63. L. H. G. Barton. *Food Manuf.*, 1938, **13**, 23. Thermophiles and their importance to canners.
64. M. J. Dunlop. *Conserva*, 1953, **1**, 244. De microbiologische Kwaliteit van suiker voor de conservenindustrie.
65. W. L. Owen and R. L. Mobley. *Ind. Eng. Chem.*, 1932, **24**, 1042. Thermophilic bacteria in refined cane sugars.
66. J. Weinzirl. *J. Bact.*, 1927, **13**, 203. Sugar as a source of the anaerobes causing explosion of chocolate candies.
67. C. T. Townsend. *Food Res.*, 1939, **4**, 231. Spore-forming anaerobes causing spoilage in acid canned foods.
68. J. A. Woerz and D. J. Lenane. *The Canner*, 1940, **90** (12), Pt. 2, Convention issue, 49.
69. R. M. Stern, C. P. Hergarty and O. B. Williams. *Food Res.*, 1942, **7**, 186. Detection of *Bacillus thermoacidurans* (Berry) in tomato juice, and successful cultivation of the organism in the laboratory.
70. F. M. Clark and A. Dehr. *Food Res.*, 1947, **12**, 122. A study of butyric acid-producing anaerobes isolated from spoiled canned tomatoes.
71. J. F. Bowen, C. C. Strachan and A. W. Moyle. *Food Tech.*, 1954, **8**, 239. Butyric fermentation in canned pears and tomatoes.
72. C. H. Spiegelberg. *Food Res.*, 1940, **5**, 115. *Clostridium pasteurianum* associated with spoilage of an acid canned fruit.
73. L. B. Jensen and W. R. Hess. *Food Ind.*, 1943, **15**, 66. Control of thermophilic bacteria in canned meat mixtures.
74. G. G. Knock and J. G. Baumgartner. *Food Manuf.*, 1947, **22**, 11. The estimation of thermophilic spores in canning ingredients.
75. E. L. Crossley and W. A. Johnson. *J. Dairy Res.*, 1942, **13**, 5. Bacteriological aspects of the manufacture of spray-dried milk and whey powders, including some observations concerning moisture content and solubility.
76. E. H. Ruyle and F. W. Tanner. *Zentralbl. J. Bakt.*, 1935, 11 *Abt.*, Bd. 2, 436. The microbiology of certain meat products.
77. E. L. Crossley. *J. Hyg.*, 1938, **38**, 205. The bacteriology of meat and fish pastes including a new method of detection of certain anaerobic bacteria.
78. C. R. Fellers. *J. Bact.*, 1926, **12**, 181. A bacteriological study of canned salmon.
79. N. D. Jarvis. Res. Rep. No. 7, 1943. U.S. Gov. Print. Off. Washington.
80. A. H. Robertson. N.Y. St. Agric. Expt. Sta. Tech. Bull. No. 130, 1927. Geneva, N.Y.
81. L. F. L. Clegg. *J. Soc. Dairy Tech.*, 1950, **3**, 238. Spore-forming thermophiles in sterilised milk.
82. E. Grinsted and L. F. L. Clegg. *J. Dairy Res.*, 1955, **22**, 178. Spore-forming organisms in commercial sterilised milk.
83. B. W. Hammer. Dairy Bacteriology, 1st ed., pp. 593, 1948. New York: Wiley.
84. E. R. Hiscox. *Chem. and Ind.*, 1947, 365. The biological stability of condensed, evaporated and sterilised milk.

▶A new edition of *Bulk Flour Handling and Storage* has been published by Henry Simon. Its main feature is an article describing a bulk flour handling and storage plant built for the Wonder Baking Co., Ltd.

Sensitivity of Cheese Starter Cultures to Nisin and Penicillin

Apart from bacteriophage, the principal inhibitors of acid production in a commercial cheese vat are penicillin and nisin according to Barbara P. Keogh, *Aust. J. Dairy Tech.*, 1956, **11** (3), 107. The sensitivity of cheese starter cultures to these two inhibitors has been studied by preliminary bacteriostatic serial dilutions followed by activity tests. At least 30% loss of activity was taken as the criterion of inhibition.

The results of these tests showed that sensitivity to penicillin is not dependent on species since *Str. diacetilactis* strains are distributed among the four groups, and *Str. cremoris* among three. There is not sufficient evidence to confirm that *Str. cremoris* strains are more sensitive than *Str. lactis*.

It is possible to develop by "training" sufficiently resistant starter cultures, but the acquisition of resistance is accompanied by the loss of some other property of the culture. A commercial starter culture claimed to be resistant to penicillin was found to tolerate at least 2 I.U. of penicillin but its rate of acid production was too slow to be of use in cheese manufacture.

The range of sensitivity of different strains is much greater for nisin than for penicillin. The extreme range of inhibitory dilutions of nisin varied by a factor of 200, whilst the factor for penicillin was only 10. It is interesting to note that all the *Str. lactis* and *Str. diacetilactis* strains were in the more resistant groups.

The results indicate that inhibition of starter activity by nisin can be overcome by the selection of the more resistant strains.

▶The suitability of foods packed in aluminium foil for radiation sterilisation is one of the topics discussed by Dr. T. H. Angel of Venesta Ltd., in a paper on Aluminium Foil and Foil Laminates, reprinted from the *Journal* of the Institute of Packaging and issued by Venesta. He also covers many other aspects of foil laminates from their specification to their various uses.

THE APPERT INSTITUTE

Canning Research in Paris

THE National Institute of Food Preservation in Paris (L'Institut National de la Conserve) was renamed the Appert Institute to mark the 150th anniversary of Nicolas Appert's method of food preservation which was celebrated two years ago. These pictures show some of the current work at the Institute.

The Institute was founded by the French professional canning organisations in 1949. Its aims are to collect and to disseminate technical information on food preservation, particularly on canning; to supply technical advice to manufacturers; and to carry out research on canning and other methods of food preservation. It is divided into three sections: documentation, research and analysis.

Research problems studied so far include work on the enzymic browning of mushrooms (*Agaricus campestris*), the pectic content of apricots, causes of hardening in canned peas, and origins of discoloration in certain vegetables (*e.g.* cauliflower) during sterilisation.

Attached to the Institute is a Technical School for Food Preservation (L'Ecole Technique de la Conserve) which provides elementary courses for foremen and specialist workers in food factories and higher courses for canning engineers, etc.

The Institute and the Technical School combine to give the French food preservation industry the necessary facilities for studying improved methods of manufacture and the consumer canned foods of higher nutritive value and better taste and quality.

Top: **Organoleptic examination of can contents.** *Centre:* **Cans are tested for sterility in the bacterial culture room.** *Right:* **Measurement of *p*H and other properties are made in the well-equipped physical laboratory.**

Rapeseed Oil as a Food

By Joyce L. Beare*

The nutritional value of rapeseed oil has aroused wide interest, particularly since it was extensively used in Germany during the war for margarine manufacture. Here is a comprehensive summary of the published data on its characteristics and physiological effects.

THE rape plant belongs to the family *Cruciferæ* and the genus *Brassica*. Two common species, *Brassica campestris napus L.* and *Brassica campestris rapa L.* have winter and summer varieties.

In almost all countries of Asia and Europe the rape plant has been cultivated. Large quantities of rapeseed oil (RSO) were produced in India, Japan,[21] China[3] and in the East Indies, where it is the most important oil for domestic use, particularly in curries and other hot dishes.[4] The winter variety of *Brassica napus* was commonly grown in France and Belgium.[3] In Poland the best-known brand of margarine had RSO as its chief ingredient,[5] and a beef tallow-RSO mixture was thought to be similar to lard for the making of doughnuts.[6] RSO was used in Great Britain for the greasing of bread pans[1] and in the U.S.A. in the paint industry, for which 14 million lb. were imported during a 10-year period prior to 1942. The American estimate for the yield was 1,000 to 1,500 lb. per acre for the annual varieties, which require about 90 days for maturity.[3] Seed of Argentine rape was brought to Canada from Argentine in 1941 and tested on experimental farms.[7] In 1954-55 the Canadian rapeseed production was 77 million lb., of which 21% was crushed in that country; in 1955-56 the estimated rapeseed production was 305 million lb.,[8] a fourfold increase over the previous year. There are two plants for processing RSO in Canada, one at Altona, Manitoba, and the other at Saskatoon.

Chemical constants of RSO

RSO (rape oil, colza oil) has been defined as "an edible oil obtained from the seed of the rape plant (*Brassica napus L.*) or from the seed of closely related Brassica species which yield oils similar in composition and character to the oil obtained from *Brassica napus L.*"[9]

Investigations of Canadian grown rape seed have shown no relationship between the condition of the seed and the amount of oil.[10, 11] From India it was reported that seeds stored under dry, well-ventilated conditions for two years did not deteriorate as judged by oil and nitrogen contents, acid value, saponification and iodine numbers.[12] RSO exhibited at the 1851 world's fair in a glass-stoppered bottle was found 80 years later in the basement of a German laboratory, and showed on analysis "normal constants," although it was strongly rancid.[13]

Early European studies on RSO involved the determination of melting points, saponification, iodine and Reichert-Meissl numbers, specific gravities and refractive indices. It was pointed out that the constants varied according to the method of preparation of the oil, and that solvent extracted oils were darker in colour than those obtained by cold pressing.[14] Workers in N. America determined the smoke, flash and fire points of RSO to be 256°F., 680°F. and 692°F. respectively.[15] Deuel quoted the constants of the oil as: specific gravity at 15·5°/15·5°C., 0·913 to 0·917; refractive index at 15·5°C., 1·474 to 1·476; saponification number, 170 to 179; iodine number 97 to 105; Reichert-Meissl number 0·0 to 0·6.[16] In 1941 the American Oil Chemists' Society had set down specific characteristics of RSO including unsaponifiable matter, maximum 1·5% and ether insoluble bromides, maximum 4%.[17] Craig found that different RSO's, three of which were grown in Canada, had the properties shown in Table 1.[18]

Table 1. Properties of RSO's

	Swedish	Argentine*	Polish*	Turkish*	Montana
Iodine No.	104·0	100·8	108·5	123·8	107·8
Refractive Index	1·4693	1·4683	1·4669	1·4699	1·4692
Saponification No.	171·7	173·7	174·9	177·1	178·9
Non-sap. No.	1·0	1·1	1·2	1·3	1·2

* Grown in Canada.

In 1932 it was reported that with skilful manipulation 20 to 25% purified RSO could be added to olive oil without exceeding the limits set down by the U.S.P.X. for olive oil.[19] The Cresmer test for detecting the temperature at which a definite turbidity occurs would not detect 10% RSO in olive oil, and provided only suggestive evidence of adulteration at the 20% level of RSO.[20] The detection of RSO at the 2% level, however, was achieved by determining the presence of erucic acid by its insoluble lead salt.[21]

Composition of RSO

By 1850 it was known that RSO contained erucic acid[22] to which the low saponification number was later attributed.[23] German workers estimated that the oil contained 43·5% erucic acid,[24] but Japanese RSO was reported to contain 65% erucic acid.[25]

In studies of the fatty acids of seed oils of the Brassica species, Hilditch and his co-workers found that English grown *Brassica campestris* yielded oil containing the following fatty acids: erucic, 50%; oleic, 32%; linoleic, 15%; palmitic, lignoceric, linolenic, 1% each.[22] Later work[26] showed that 1% of the fatty acids was the iso-

* Food and Drug Laboratories, Department of National Health and Welfare, Ottawa, Canada.

Table 2. Per cent fatty acids in different RSO's

Fatty acid	Swedish	Argentine	Polish	Turkish	Montana
Saturated:					
C_{16} Palmitic	2·5	3·1	2·1	2·7	2·3
C_{18} Stearic	4·4	3·9	4·6	6·9	4·6
C_{20} Arachidic	0·6	0·4	0·5	0·7	0·6
C_{22} Behenic	0·1	0·3	0·1	0·2	0·4
Unsaturated:					
C_{16} Hexadecenoic	0·3	0·2	0·4	0·4	0·3
C_{18} Oleic	6·8	13·1	22·5	10·1	27·1
Linoleic	16·4	17·3	22·8	26·7	22·7
Linolenic	9·6	8·0	9·1	15·7	8·3
C_{20} Eicosenoic	7·7	12·4	10·9	10·9	11·4
C_{22} Erucic	51·6	41·3	27·0	25·9	25·6

meric form of oleic acid and that there was not over 0·2% myristic acid. Contrary to the belief of earlier workers[33] no trierucin was present, but the glycerides were 50% dierucin and 44% monoerucin.[27] In the progressive hydrogenation of the mixed esters, linoleates proceeded more selectively to oleates than oleates to stearates, a conversion which in turn took place more readily than erucates to behenates.[27] When 50% of the original fatty acids were hydrogenated only 20% of the glycerides were fully saturated due to the variability in the composition of the glycerides.[28] After Hopkins discovered eicosenoic acid in a wild species of Cruciferæ, hare's ear mustard (*Brassica orientalis*,[29] Hilditch *et al.* reinvestigated the composition of RSO, and modified their former findings by the inclusion of eicosenoic acid, docosadienic acid and more linoleic acid.[30, 31] Other workers provided confirmation for the presence of eicosenoic acid in RSO.[32] The component glycerides of RSO were estimated to be 54% with one unsaturated C_{18} and two unsaturated C_{22} acyl groups, 28% with two unsaturated C_{18} and one unsaturated C_{22} acyl groups and 18% with one saturated and one unsaturated C_{18} and one unsaturated C_{22} acyl groups.[30] Further work on the fatty acids of RSO[33] showed that all the unsaturated C_{18}, C_{20} and C_{22} acids conform to the general formula, $RCH:CH(CH_2)CO_2H$ with n being 7, 9 or 11 and RCH:CH a mono-, di- or triethanoid group.

Chinese edible RSO was reported to have 12·7% saturated fatty acids[34] as compared with 7·3 to 8·3% found in Canadian RSO.[18] A sample of European industrially hydrogenated RSO consisted of 10% behenic, 32·8% stearic, 43·2% erucic and 10% rapinic ($C_{18}H_{34}O_4$) acids.[35] In Japan a completely hydrogenated RSO was reported to have 44% stearic and probably some palmitic, 55% behenic and 1% lignoceric acids.[36] Completely hydrogenated oil from India had 1·5% myristic, 38·5% stearic, 57·6% behenic and 2·4% lignoceric acids.[37]

In recent years there have been reported several fatty acid analyses of RSO[30, 32, 38, 39, 40] showing variation in composition. It was reported in Europe that warm climatic conditions favoured the formation of saturated fatty acid while low temperatures favoured that of unsaturated fatty acids,[41] and that winter RSO of different origins varied in total fat content by as much as 19%.[42] From the recently published data of Craig,[18] Table 2 has been compiled to show the greatly different percentages of fatty acids in five different varieties.

The steroids of RSO have also received attention. In 1909 Windaus and Welsch[43] first isolated from the waste products of RSO a steroid which early workers believed to be sitosterol. However, Fernholz and Stavely showed the steroid, called brassicasterol from its origin of Brassica rapa, or oil of turnip, to be quite different from stigmasterol.[43] They proposed 7,8-dihydroergosterol as its structural formula, and suggested that it was the characteristic sterol of RSO.[44, 45] Later Fernholz and MacPhillamy isolated another sterol, campesterol, from RSO, soybean and wheat germ oils.[46] Squalene a precursor of cholesterol[47] was found to be present in RSO to the extent of 24 to 28 mg. per 100 gm. of oil.[48, 49]

Lange reported a value of 55 mg. per 100 gm. of oil for the total tocopherols of RSO.[50]

All the phosphorus in the unrefined RSO was stated to be in the phosphatide form; sugar and some of the sulphur were accounted for in thio-glucosides, most of which were removed by alkali refining.[51] It had been thought for a long time that RSO contained sulphur, but its presence was believed to be due to high temperature expression extraction with carbon bisulphite or moist storage conditions causing the enzymatic breakdown of sinigrin, a glycoside found in Brassica plants, to glucose and alkyl isothiocyanate.[3] French workers reported the loss of volatile sulphur during the extraction of RSO.[52, 53] Lips devised a method for sulphur analysis of Canadian erucic acid oils involving a preliminary oxidation of the sulphur-containing compounds with concentrated hydrogen peroxide, ignition with strong alkali, solution in hydrochloric acid, and turbidimetric determination of the sulphur as sulphate.[54] He found the sulphur content of the oil to be less than 0·001%. That of the original seed was apparently lost during extraction and left in the meal residue. Alkali refined and bleached oil had no detectable sulphur.

Use of RSO in wartime Europe

During the last war Germany made extensive use of RSO in margarine, the chief source of fat in the diet. Imports of soybean, palm, coconut, peanut, whale and other marine oils had been discontinued, and the oil reserves within the country soon exhausted.[55, 56] In Northern Europe where rape and mustard were the only oil-bearing crops, the production of RSO was subsidized by the respective country, for it was generally uneconomical. RSO, entirely derived from home-grown seeds,[57] was extracted and refined in equipment previously built to handle other vegetable oils. After 1941 and for the next four years, the production of RSO in Germany was estimated to be 250,000 tons per year.[57, 58]

From the surveys of oilseed mills and vegetable oil refiner-

ies,[56, 57, 58, 59, 60, 61, 62, 63, 64, 65] it was evident that Germany had a large number of processing plants, particularly in and around Hamburg. One of the largest crushed 600-700 tons of rapeseed per day. Seeds having 42% oil and 7-8% moisture were subjected to low pressure expellers, the first and third pressings of which left residues with oil contents of 28, 22 and 15-18% respectively. A cage presser reduced the oil content to approximately 6·5%, after which the presscake was ready for the extraction plant with batch-type units. Although some oil was sold without processing, the usual treatment was to neutralise the oil with aqueous NaOH at 80°C., remove the soaps, bleach the neutral oil in vacuum kettles with activated earth and deodorise it at 160°C. Since RSO had tendencies toward flavour reversion great precaution was taken during the operations of bleaching and deodorising.[58]

The lecithin, 0·2 to 0·3% by weight of the seed, recovered from the RSO was dark, of inferior quality, and not suitable for use in chocolate.[59]

Hydrogenation of RSO, a relatively difficult oil to harden,[60] was accomplished with electrolytic gas, and the non-selective catalyst produced by mixing nickel formate with the oil and reducing it with the hydrogen. To obtain a product with a melting point of 30-32°C. the nickel formate was re-used 10-20 times[59] or 50 times,[55] depending on the effectiveness of the hydrogenation desired; for a melting point of 40-42°C., new nickel formate was employed. Clogging difficulties were avoided by filtering the oil at 100°C. After hydrogenation, the oil was neutralised to a free fatty acid content of 0·03%, and deodorised with superheated steam at 450°C.

All of the hardened oil was sold to the margarine industry to be used in a somewhat standardised margarine formula. In November, 1945, the fat blend in all margarine factories consisted of 42% liquid RSO, 38% hardened RSO of m.p. 30-32°C., 10% hardened RSO of m.p. 40-42°C. and 10% animal fats. Other constituents were lecithin, carotene for colour, molasses, potato flour, salt and water. A high content of salt was considered to produce an objectionable flavour with RSO.[60]

Although RSO was not used in large quantities by the German industry before the war[60] it supplied a significant portion of the fat calories during the years of scarcity. At the beginning of the war, the German people were rationed to 270 gm. of fats and oils per week, but at the end of the war this amount was reduced to 50 gm. per week, half butter and half margarine.[63] In a typical margarine of 80% fat[55] the amount of RSO consumed under the latter austere conditions would be only 20 gm. per person per week. With the usual storage conditions margarine could be kept for 6-8 weeks,[66] a sufficient length of time for a product in great demand.

RSO had not been produced in the Netherlands before the war, but through necessity came into prominence as an edible oil. In Belgium the oil was used at the beginning but not at the end of the war because of the high costs involved.[65] It is unfortunate that no clinical data are available on the effects of the human consumption of RSO.

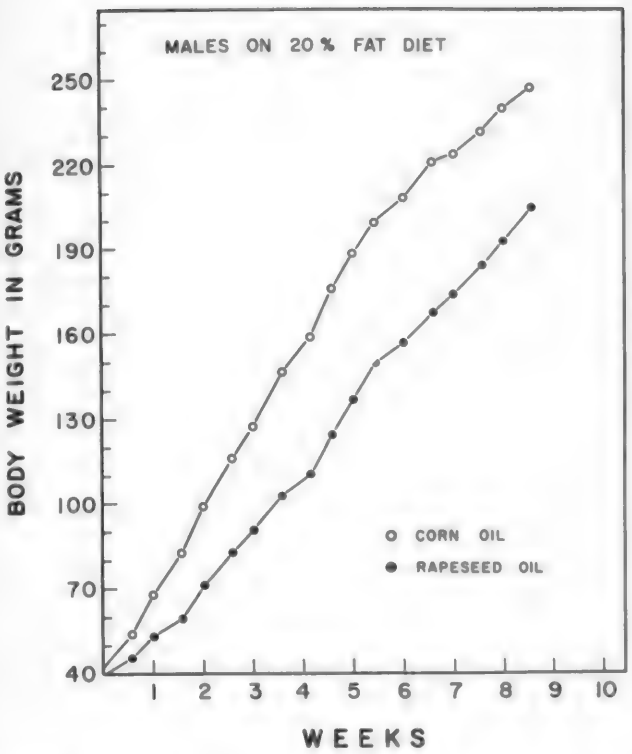
Canadian grown RSO in food products

Grace found that rapeseed screened from wheat grown in Western Canada yielded oil too dark and unsuitable for edible purposes. The undesirable colour he attributed to chlorophyll in the rape plants, which had ripened unevenly. To produce a colour similar to commercial corn and cottonseed oils, lecithin-free and alkali refined RSO was readily bleached by heating to 100°C. for 20 min. with 2% clay. Bleached oil was characterised by its high transmission above 320 mμ when measured spectrophotometrically.[67] Before being submitted to consumers' acceptance tests, RSO was refined with 10° Be NaOH, bleached for 20 min. at 212°F. with 2 or 4% *Superfiltrol* under CO_2, steam deodorised under vacuum at 464°C. for one hr. and washed before and after refining to remove the lecithins. A 24-member taste panel tested mayonnaise, pastry and doughnuts made with RSO, and found it to be as satisfactory as corn oil for the preparation of mayonnaise and pastry, but not for doughnuts. Aged RSO and corn oil, however, were comparable.[68] Shortening prepared from hydrogenated RSO had a melting point of 45·4°C., whereas a commercial shortening, used as a control, had a melting point of 38·0°C. Despite the difference in composition, RSO shortening was acceptable for pastry and doughnuts as judged by the taste panel, and gave good results in baking volume experiments.[69] Laboratory prepared margarine from RSO had a texture which tended to be not so desirable as other margarines and butters, but still within the range of average consumer ratings. When used on bread its texture seemed softer than other spreads.[70] It had a higher abnormal flavour rating than butter when the products were fresh, but no significant difference when they were both aged.

Digestion and metabolic effects of RSO

The first direct determination of the digestibility of RSO was carried out by Holmes on humans in 1918.[71] When 82 grams of RSO, 7% of the total diet, were supplied to each of four people, the average coefficient of digestibility was 98·8%, a figure not corrected for soaps. No laxative effects of the RSO-containing diet were evident. Also working with humans, Deuel found the digestibility of RSO to be 99%.[72]

In 1940 Deuel reported that of all the vegetable oils he had studied in fat recovery tests from the gastrointestinal tract of rats RSO had the slowest rate of absorption. Three hours after the administration of the oil the absorption was 37·5%, and six hours after it was 43·4%.[73] Later he and his co-workers showed that RSO had the lowest coefficient of digestibility: 77% for the crude oil and 82% for the bleached,



Weight gains of rats fed 20% corn oil and 20% rapeseed oil in a synthetic diet.

alkali refined oil[74] indicating a species difference between rats and humans. The erucic acid fraction was believed to be responsible. Although Hilditch *et al*, had shown that trierucin as such did not exist in RSO,[30] Deuel believed it to be hydrolysed in the gastrointestinal tract. In any case the freed erucic acid was excreted as soap. Carroll[75] found the digestibility coefficient of the RSO constituent, erucic acid, to be 52%, and that of its methyl and ethyl esters 55% and 59% respectively. In a recent private communication, he stated that the erucic acid digestibility coefficient varied from 37% to 61%, the average being 53%.

From a study[76] of the fatty acid composition of dietary and chyle fat in a child with a cylothorax condition it was suggested that RSO was largely absorbed without hydrolysis. The assumption was made that similar absorption coefficients of fatty acids indicated an absence of splitting of the glyceride molecules.

After a test dose of 60 g. of RSO to humans, lipemia lasted longer than after a similar dose of synthetic fat or sesame oil. The increase in serum cholesterol was 15 to 30 mg.% with RSO as compared to 10 to 20 mg.% and 5 to 15 mg.% respectively for the others.[77]

The caloric value of RSO and of lard as determined by heats of combustion in a bomb calorimeter was found to be practically the same.[77] Further evidence that RSO is calorically comparable to lard came from the work of Middleton and Campbell,[79] who used the method of Rice *et al*.[80] for growth under conditions of energy restriction. Preliminary data suggested that rats supplied with adequate nutrients except for a deficiency of calories responded equally well in a one-week test to supplements of RSO and lard.

RSO studies were carried out in Hungary by Beznak *et al*.,[81, 82] who fed a number of oils at the 30% level. There was a marked growth retardation in rats fed a commercial RSO refined by sulphuric acid treatment. Although it was thought that a toxic compound, quite apart from the fatty acid constituents and not found in alkali refined products, was responsible, the authors had difficulty supporting their supposition. "Rape-margarine" gave results similar to those of butter while hardened and steamed RSO were more satisfactory.

It is interesting to note in Deuel's work that RSO fed as 15% of the diet to adult female rats of approximately 160 to 175 g. did not appear to have any adverse effects on weight gain,[74] whereas RSO fed as 10% of the diet to 29-day old rats of both sexes appreciably reduced weight gains.[83] The latter observation gave confirmation to the work of Boer *et al*., who found that rats grew less favourably on RSO than on butter.[44] In a series of studies in Sweden,[85, 86, 87, 88] it was shown that rats kept for about 3 years gave no indication of a difference between butter and margarine, which varied during the experimental period from 0 to 47·5% hardened RSO. The old rats died with pneumonia, nephritis or other kidney conditions believed unrelated to diet.

From the Netherlands, Thomasson[89] reported that in feeding experiments of six weeks' duration the average body weight gain decreased as the amount of RSO in the diet increased. At the highest level of 73 cal.% of RSO all animals died after being on diet an average of 17 days. Since the food efficiency of the RSO diet was comparable to the other diets tested, growth retardation was the effect of RSO. Thomasson advanced the theory that fatty acids of 20 or more C atoms were responsible, and later gave support to his theory by showing that the erucic acid with 22 C atoms caused the decreased weight gains of RSO-fed rats.[90] A further finding was that RSO affected the longevity of rats, for when they consumed less food and gained less weight they lived 20 to 25% longer than those receiving a comparable amount of butter. More serious pathological changes were observed in the butter-fed rats, although a slight liver degeneration was found only in the RSO-fed animals.[91] Using a modification of Deuel's method for measuring the rate of intestinal absorption,[73] Thomasson found a significant correlation between the

rate of RSO absorption and its growth-promoting action. Of the 18 oils tested, RSO was the most slowly absorbed at the end of 3 hr. and the fourth slowest at the end of 6 hr. For 50% of the RSO to be absorbed 8 to 9 hr. would be required as compared with 6 hr. for other common vegetable oils. Correspondingly, RSO had the second poorest growth-promoting ability, only kapokseed oil being inferior.[92] In a private communication Thomasson pointed out that the curve of body weight gains of rats on RSO showed an increased rate in the second part, suggesting that the rats had possibly become adapted to the diet.

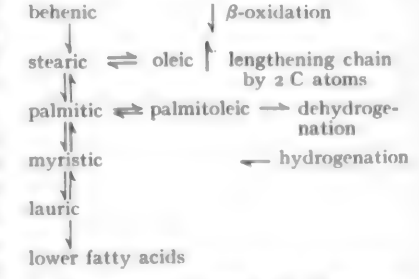
Increased amounts of thiamine resulting from bacterial synthesis were reported in urine, fæces and viscera of humans fed RSO.[93]

Carroll,[94] who has also observed the growth-retarding effect of RSO, has been primarily concerned with its relationship to cholesterol metabolism. RSO fed to rats at the 25% level for 4 weeks produced pale and slightly larger adrenals with an increased amount of adrenal cholesterol. All fats and oils fed at the 25% level caused an elevation of adrenal cholesterol over that of fox chow with only 3·5% fat. With RSO the total adrenal cholesterol was 5·10 mg., with corn the total adrenal cholesterol was 1·81 mg. Most of the increase in adrenal cholesterol was accounted for in the esterified portion, and was confined to the cortex. The liver, too, showed an increase in bound cholesterol. By sacrificing groups of rats on the RSO-containing diets at different periods of time, it was found that the maximum concentration of cholesterol was reached at the end of two weeks. A reduction in adrenal cholesterol occurred after 3 weeks of feeding fox chow instead of the RSO-containing diet. In a second paper, Carroll and Noble[95] determined the effects of the increased adrenal cholesterol on the endocrine function by subjecting rats to fasting, insulin treatment, cold temperatures, removal of one adrenal, ACTH administration, desiccated thyroid feeding, high protein diet, tumour growth, stilboestrol and cortisone administration. RSO appeared to have an additive effect on the other stresses, and did not markedly alter the function of the gland. The ovaries were smaller with RSO and the absolute amount of cholesterol not significantly raised. No œstrus cycle irregularities were noted. The factor in RSO responsible for the changes in adrenal cholesterol was shown to be erucic acid, the activity of which was destroyed by hydrogenation of the oil.[96] Besides increasing adrenal and liver cholesterol concentrations, erucic acid augmented the excretion of cholesterol, apparently produced in tissue other than the liver since the biliary excretion of cholesterol was not increased.[75] In pointing out the contrast between the effects of orally administered RSO and cholesterol, Carroll showed that RSO increased the adrenal cholesterol of rats and mice, but not of rabbits, guinea pigs, chickens or dogs, whereas dietary cholesterol was deposited in those species resistant to changes by RSO. No change was found in the digestibility of RSO among these species.[97]

The effect of feeding RSO at various levels has been investigated in the Food and Drug Laboratories.[98] Corn oil, RSO, and mixtures of the two oils with 5%, 10%, 20%, 40% and 80% RSO were fed at two levels, 10% and 20% by weight of the diet. No change was found in liver, adrenal, ovary or testes weights after the animals had been on diet 68 to 70 days. Body weight gains showed a linear response with decreasing amounts of RSO, the response to RSO apparently diminishing as the experiment progressed. Weight gains were more depressed in females than in males by feeding corn oil and RSO, both of which had been heated to 200°C. for 120 hr. It had previously been reported that both heated corn oil and heated RSO had a growth-depressing action.[99, 100] In a second series of studies[98] unhydrogenated RSO was found to be inferior to hydrogenated RSO, and both of them inferior to mixtures of either with unhydrogenated or hydrogenated soy oil in producing significant weight changes within 2 weeks.

Working with rat liver homogenates, Wood and Migicovsky[101] found that of the fatty acids they tested, erucic acid inhibited cholesterol synthesis to the greatest extent, 77·5%, and that it was not a simple competition of erucic acid and acetate. Since CoA present in high concentration can inhibit cholesterol synthesis it was suggested that the mechanism of synthesis might be hindered at the acetyl CoA stage.

Behenic acid, produced by hydrogenating erucic acid, has been found to be very poorly absorbed. In the investigations of Bernhard and Vischer[102] isolated erucic acid was saturated with heavy hydrogen and its ethyl ester fed at the 10% level to only 2 rats. Forty per cent. of the behenic acid was absorbed. Its heavy hydrogen was found in greatest concentration in stearic acid, but was also found in palmitic, myristic and oleic acids of body fat. While erucic acid was found in depot fat following the ingestion of RSO, only a trace of behenic acid was detected. Evidence was given for its β-oxidative decomposition, and the following scheme presented:



More recent work of Bernhard *et al.*[103] showed that rats fed 2 to 3 ml. of RSO per day deposited 5% erucic acid in their body fat. Of the fæcal fatty acids, 9·6% was erucic acid and 17·6% stearic acid; but when the bile was removed through a fistula, 10·0% was erucic acid and 37·6% stearic acid. It appeared, therefore, that bile was necessary for the reabsorption of stearic acid, but not of erucic acid.

When studying the effects of different dietary oils on cow's milk, Hilditch and Thompson[104] found that 4 oz. of RSO fed twice daily to cows for a week or more did not markedly affect the composition. There was an increase in the proportion of oleic acid and the appearance of erucic acid to the extent of 3·7% by weight of the total milk fatty acids.

RSO-fed geese had subcutaneous and peritoneal fat resembling RSO in consistency, odour, iodine number and melting point.[105] However, Hopkins *et al.*[106] found 12% erucic acid and only a trace of behenic acid in the body fatty acids of rats fed a diet of 5% methyl erucate. The administration of methyl erucate appeared to cause no change in the amount of body fat, although the acid was not deposited to the extent of eicosenoic and oleic acids when they were supplied in a similar manner. There was no indication of erucic acid being shortened to eicosenoic or arachidic acids for deposition. Since the proportions of palmitic and oleic acids were increased on the erucate diet, it was suggested that there was a greater synthesis of fat from carbohydrate. Further evidence of this comes from the fact that erucic acid increased the amount of lipid excreted but did not change the amount laid down in animal tissue.

Summary

RSO is now being produced in Canada in increasing amounts. On this continent it has not been used for edible purposes, but in other parts of the world has been widely consumed. In wartime Germany it constituted a major part of the ration of fats and oils.

Data on the physiological action of RSO in the rat indicate that it has a slow rate of absorption and a low coefficient of digestibility. When fed as a substantial part of the diet, it produces growth retardation, a longer life span, and an increased concentration of cholesterol in the adrenal cortex, liver and fæces. These characteristics of the oil are attributed to its erucic acid, the effects of which are reduced by hydrogenation. The body incorporates erucic acid into its depot fat less readily than mono-unsaturated fatty acids of shorter chain length.

Since information on the metabolism of erucic acid is still lacking the status of RSO as a food can be determined only through further experimental work.

Addendum

The production and export position of rapeseed oil was recently reviewed (*Oils and Oilseeds J.*, 1956, **9**, 6, 5.

Wagner, Seelig and Bernhard (*Hoppe-Seylers Zeitschrift P. Chemie*, 1956, **306**, 96) reported that 10% rapeseed oil fed to choline-supplemented rats resulted in the depot fat having 7·6% erucic acid. Although there was similar erucic acid deposition in the carcasses of choline-deficient rats there was a better than two-fold increase in the proportion of erucic acid in the liver, and about four times the amount of total fatty acids.

Murray, Campbell, Hopkins and Chisholm (to be published) showed that a synthetic diet with 5% methyl erucate decreased the weight gains of females but not of males when compared to the same basal diet with 5% corn oil. Methyl erucate increased the excretion of fatty acids, mainly erucic acids, and of unsaponifiable material. The coefficient of digestibility of the ester was 90% higher than previously reported.

REFERENCES

1. J. Lewkowitsch, Chem. Technology and Analysis of Oils, Fats and Waxes, Macmillan, London, Vol. II, 1909.
2. J. Lewkowitsch, G. H. Warburton, Chem. Technology and Analysis of Oils, Fats and Waxes, Macmillan, London, 6 ed., Vol. II, 1922.
3. P. J. Kolachov, Eighth Annual Chemurgic Conf., Chicago, Paper 136, 1942.
4. Encyclopædia Britannica.
5. J. Czaplicki, D. Kazimierz, A. Jakubowski, W. Krobikowski, H. Niewiadomski, I. Urusha, *Prace Gownego Inst. Przemyslu Rolnego i. Spozywczego*, 1954, **4**, 1; *C.A.*, 1955, **49**, 14220.
6. A. Ruthowski, *Prezemyal Rolny i Spozywezy*, 1954, **8**, 87; *C.A.*, 1955, **49**, 2087.
7. Manitoba Dept. of Agriculture and Immigration, Winnipeg. *Special Crops, Publication* 187, 1944.
8. Dominion Bureau of Statistics, *Field Crop Report* 23, 1956.
9. U.S. Dept. of Agric., *Food Inspection Division* 169, 1917.
10. J. A. Anderson, T. R. Aitken, *Can. Grain Research Lab., Winnipeg, Ann. Rept.*, 1943, **17**, 33 (published 1944).
11. *Idem, Ibid.*, 1944, **18**, 36 (published 1945).
12. Z. Alam, S. Almad, *Indian J. Agr. Sci.*, 1946, **16**, 279.
13. J. Davidson, *Seifensieder Ztg.*, 1930, **57**, 560; *C.A.*, 1930, **24**, 5521.
14. N. Dublyanskaya, *Maslobaino Zhirovac Delo*, 1932, **1**, 65; *C.A.*, 1932, **26**, 4491.
15. W. H. Dickhart, *Am. J. Pharm.*, 1932, **104**, 284.
16. H. J. Deuel, The Lipids, Interscience Publishers, Inc., N.Y., Vol. I, 1951.
17. M. F. Lauro, *Oil and Soap*, 1941, **18**, 194.
18. B. M. Craig, *Can. J. Tech.*, 1956, **34**, 335.
19. R. Miller, C. W. Ballard, *J. Am. Pharm Assoc.*, 1932, **21**, 349.
20. M. F. Lauro, *Oil and Soap*, 1932, **9**, 172.
21. J. Grossfield, *Chem. Ztg.*, 1935, **59**, 935.
22. T. P. Hilditch, T. Riley, N. Y. Vidyarthi, *J. Soc. Chem. Ind.*, 1927, **46**, 457.
23. Anon., *Bull. Imp. Inst.*, 1915, **13**, 452; *C.A.*, 1916, **10**, 396.
24. K. Taufel, C. L. Bauschinger, *Z. Untersuch. Lebensm*, 1928, **56**, 253.
25. Y. Toyama, *J. Chem. Ind., Japan*, 1922, **25**, 1044; *C.A.*, 1923, **17**, 3106.
26. T. P. Hilditch, T. Riley, N. Y. Vidyarthi, *J. Soc. Chem. Ind.*, 1923, **46**, 462.
27. T. P. Hilditch, H. Paul, *J. Soc. Chem. Ind.*, 1935, **54**, 331.
28. *Idem, ibid.*, 1935, **54** 336.
29. C. Y. Hopkins, *Can. J. Research*, 1946, B**24**, 211.
30. T. P. Hilditch, P. A. Laurent, M. L. Meara, *J. Soc. Chem. Soc.*, 1947, **66**, 19.
31. M. N. Baliga, T. P. Hilditch, *J. Soc. Chem. Ind.*, 1948, **67**, 258.
32. S. L. Kapur, B. F. Daubert, *J. Am. Oil Chem. Soc.*, 1949, **26**, 472.
33. M. N. Baliga, T. P. Hilditch, *J. Chem. Soc., Suppl. Issue*, No. 1, 1949, 591.
34. T. Y. Tang, *Acad. Sinica Inst. Chem. Mem.*, 1930, **2**, 1; *C.A.*, 1932, **26**, 5779.
35. T. F. Kitaev, *Ukrainskii Khem. Zhurnal*, 1925, **1**, 40; *C.A.*, 1928, **22**, 2675.
36. S. Ueno, M. Iwai, *J. Soc. Chem. Ind., Japan*, 1938, **41**, 256; *C.A.*, 1938, **32**, 9533.
37. J. J. Sudborough, H. E. Watson, P. R. Ayyar, N. R. Damle, *J. Indian Inst. Sci., J.A.*, 1926, 25; *C.A.*, 1927, **21**, 505.
38. M. Rollet, C. Paquot, *Bull. Soc. Chem.*, 1945, **12**, M1048.
39. J. V. Long, *Chem. in Can.*, 1956, **8**, No. 5, 40.
40. C. G. Youngs, T. M. Mallard, B. M. Craig, H. R. Sallans, *Can. J. Chem.*, 1951, **29**, 871.
41. G. Eckstein, *Industria y quim*, 1943, **5**, 25; *C.A.*, 1943, **37**, 4814.
42. E. Lowig, O. Baumgartner, *Forschungsdienst*, 1940, **9**, 496; *C.A.*, 1942, **36**, 6029.

43. E. Fernholz, H. E. Stavely, *J. Am. Chem. Soc.*, 1939, **61**, 142.
44. *Idem, ibid.*, 1940, **62**, 428.
45. *Idem, ibid.*, 1940, **62**, 1875.
46. E. Fernholz, H. B. MacPhillamy, *J. Am. Chem. Soc.*, 1941, **63**, 1155.
47. D. Steinberg, D. S. Fredrickson, *Ann. N.Y. Aca. Sci.*, 1956, **64**, 579.
48. J. Fitelson, *J. Assoc. Official Agr. Chem.*, 1943, **26**, 506.
49. *Idem, ibid.*, 1945, **28**, 282.
50. W. Lange, *J. Am. Oil Chem. Soc.*, 1950, **27**, 414.
51. M. Lishkevich, *Masloboino-Zhirovaya Prom.*, 1940, **16**, 12; *C.A.*, 1941, **16**, 12.
52. E. Andre, M. Charles, *Compt. rend.*, 1943, **217**, 301.
53. *Idem, ibid.*, 1944, **218**, 850.
54. H. J. Lips, *Can. J. Tech.*, 1952, **30**, 61.
55. Allied Investigations, *Reports No.* 14, Chap. II, 1945.
56. Allied Investigations, Fiat Final Report, No. 414, 1945.
57. *Ibid.*, No. 274, 1945.
58. *Ibid.*, No. 297, 1945.
59. *Ibid.*, No. 92, 1945.
60. Allied Investigations, Bios Misc. Report, No. 19, 1945.
61. Allied Investigations, Fiat Final Report, No. 407, 1945.
62. *Ibid.*, No. 364, 1945.
63. *Ibid.*, No. 213, 1945.
64. *Ibid.*, No. 86, 1945.
65. *Ibid.*, No. 182, 1945.
66. N. H. Grace, A. Zuckerman, *Can. Chem. Process Inds.*, 1947, **31**, 571.
67. N. H. Grace, *Can. J. Research*, 1948, 26F, 349.
68. H. J. Lips, N. H. Grace, E. M. Hamilton, *ibid.*, 1948, 26F, 36.
69. H. J. Lips, N. H. Grace, S. Jegard, *ibid.*, 1949, 27F, 28.
70. H. J. Lips, N. H. Grace, *Can. Food Ind.*, 1950, **21**, 21.
71. A. D. Holmes, *U.S. Dept. Agr. Bull.*, 1918, No. 687.
72. H. J. Deuel, R. M. Johnson, C. E. Calbert, J. Gardner, B. Thomas, *J. Nut.*, 1949, **38**, 369.
73. H. J. Deuel, L. Hallman, A. Leonard, *J. Nut.*, 1940, **20**, 215.
74. H. J. Deuel, A. L. S. Cheng, M. G Morehouse, *J. Nut.*, 1948, **35**, 295.
75. K. K. Carroll, R. L. Noble, *Can. J. Biochem. Physiol.*, 1956, **34**, 981.
76. J. Fernandes, J. H. van de Kramer, H. A. Weijers, *J. Clin. Invest.*, 1955, **34**, 1026.
77. G. Kabelitz, *Arch. ges. Physiol.*, 1944, **247**, 593.
78. M. Krajeinovic, *Z. Untersuch Lebensm.*, 1941, **82**, 142.
79. E. J. Middleton, J. A. Campbell, unpublished data.
80. E. E. Rice, W. D. Warner, P. E. Mone, C. E. Poling, *Fed. Proc.*, 1956, **15**, 571.
81. A. Von Beznak, M. Von Beznak, I. Hajdu, *Ernahrung*, 1943, **8**, 209.
82. *Idem, ibid.*, 1943, **8**, 236.
83. H. J. Deuel, S. M. Greenberg, E. E. Straub, D. Jue, C. M. Gooding, C. F. Brown, *J. Nut.*, 1948, **35**, 301.
84. J. Boer, C. P. Jansen, A. Kentie, *J. Nut.*, 1947, **33**, 339.
85. B. v. Euler, H. v. Euler, I. Ronnestam-Saberg, *Arkiv. for Kemi, Mineralogi o. Geologi*, 1946, 22A, No. 8.
86. *Idem, ibid.*, 1946, 24A, No. 18.
87. *Idem ibid.*, 1956, 24A, No. 20.
88. B. v. Euler, H. v. Euler, *Arkiv for Kemi*, 1951, **3**, 31.
89. H. J. Thomasson, *J. Nut.*, 1955, **56**, 455.
90. H. J. Thomasson, J. Boldingh, *J. Nut.*, 1955, **56**, 469.
91. H. J. Thomasson, *ibid.*, 1955, **57**, 17.
92. *Idem, ibid.*, 1956, **59**, 343.
93. Z. Sato, H. Terado, *Vitamins (Japan)*, 1953, **6**, 263; *C.A.*, 1955, **49**, 14955.
94. K. K. Carroll, *Endocrinology*, 1951, **48**, 101.
95. K. K. Carroll, R. L. Noble, *Endocrinology*, 1952, **51**, 476.
96. K. K. Carroll, *J. Biol. Chem.*, 1953, **200**, 287.
97. *Idem, Proc. Soc. Exp. Biol. Med.*, in press, 1957.
98. J. L. Beare, T. K. Murray, J. A. Campbell, unpublished data.
99. O. C. Johnson, T. Sakuragi, F. A. Kummerow, *J. Am. Oil Chem. Soc.*, 1956, **33**, 433.
100. E. W. Crampton, F. A. Farmer, F. M. Berryhill, *J. Nut.*, 1951, **43**, 431.
101. J. D. Wood, B. B. Migicovsky, *Can. J. Biochem. Physiol.*, 1956, **34**, 861.
102. K. Bernhard, E. Vischer, *Helv. Chim. Acta.*, 1946, **29**, 929.
103. K. Bernhard, E. Seelig, H. Wagner, *Hoppe-Seylers, Zeitschrift f. Physiol. Chem.*, 1956, **304**, 138.
104. T. P. Hilditch, H. M. Thompson, *Biochem. J.*, 1936, **30**, 677.
105. M. Chomyszyn, *Roczniki Nauk Rolniczych*, 1954, 69B, 91; *C.A.*, 1955, **49**, 11798.
106. C. Y. Hopkins, M. J. Chisholm, T. K. Murray, J. A. Campbell, *Am. Oil Chem. Soc. Meetings, Chicago*, Sept., 1956.

ACKNOWLEDGMENTS

Appreciation is expressed to Dr. J. A. Campbell and Mr. Keith Murray for their valuable criticisms and suggestions.

▶ The story of how Clarence Birdseye's hunting and fishing holiday in Labrador in 1928 led to the foundation of the quick-frozen food industry is told in a 24-page booklet, *Quick-Frozen Food*, published by Unilever, Ltd. As well as reviewing the history of the process, it also describes and illustrates the various stages of processing, using quick-frozen peas as an example.

▶ A plan for fire risks is set out by the Fire Protection Association in a recent issue of their *Bulletin*. Under the slogan "Good Management Means Fewer Fires" they have set out a number of questions dealing with cleanliness, tidiness, storage and maintenance of machinery, heating and lighting systems. By answering the questions, managements can check the fire safety of their factory. Free copies of the bulletin are available on application to the F.P.A. at 15, Queen Street, London, E.C.4.

Can Lacquers and Candid Comments

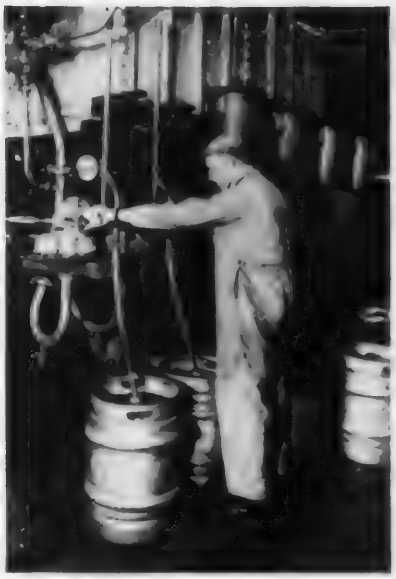
NOT only his friends in the food industry but many others will welcome A. Ll. Matthison's latest volume of reminiscences.* In the years that he worked for Arthur Holden and Sons, Ltd. (he started as warehouse manager and became chairman), Mr. Matthison was well known to canners as an authority on stoving lacquers for the insides of cans. His book *Tin Plate Decoration and the Lacquering of Food Containers* was widely circulated at home and abroad and made him friends among food chemists and technicians in South Africa, Canada and America and on the Continent.

In his 89th year Arthur Llewellyn Matthison's reputation as an essayist, theatre historian and raconteur is no less high. He has written prolifically: technical books, a play, a novel, two autobiographical works and several volumes of sketches and essays, usually with such delightfully inconsequential titles as *Bullocks at Stamford Fair* and *Elephants on the Stratford Road*.

Nobody who knows Mr. Matthison or his previous works will be surprised to learn that there is absolutely nothing about Woolverton in his new book. The subjects dealt with include reminiscences of the theatre; physical culture—the author joined the Birmingham Athletic Club at the age of 40 where he fenced, boxed, wrestled and played basket-ball until he was nearly 70—the postal telegraph service in which he spent 12 years; the paint and varnish industry in which he spent 60 years; broadcasting; socialism; osculation ; and many other attractive matters. Mr. Matthison concludes his book with an epilogue in which he courteously takes leave of the reader and assures him of the pleasures of old age.

This is a book which is not easily put down once opened. The style combines humour with philosophy and information with criticism.

* *The Sun Shines on Woolverton.* By A. Ll. Matthison. Cornish Bros., 1957. Pp. ix+100, illustr. 10s. 6d. net.



Left: **VATS. In the lower picture wooden vats are being scrubbed by three men. Above stainless steel vats are replacing the wooden type and can be cleaned by a mechanical washer.** *Right:* **Prototype pre-set meter on experimental rig.**

New Techniques in Beer Manufacture

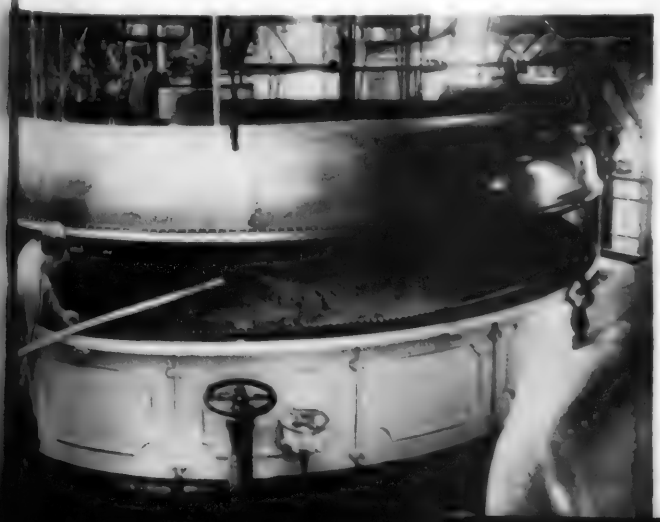
A CASE STUDY IN AUTOMATIC PRODUCTION

AMONG the papers presented at the Automatic Production Conference at Harrogate last month was a case study of operations at Guinness's Park Royal Brewery by G. W. Barton, the company's senior assistant engineer. Some of the changes in method and technique, *i.e.* the removal of spent grain from mash tuns and spent hops from hop backs; cask and vessel cleansing; bulk delivery and instrumentation, were described.

About 20 tons of spent grain must be removed from each mash tun—cast-iron vessels each 20 ft. in dia. and about 7 ft. deep—before the next mash is prepared. Usually this arduous task is performed by hand, but at Park Royal a small amount of liquor is left with the spent grain and the mixture pumped away: a process taking 12 hr. instead of 66 by the manual method. A similar method is used for cleaning the copper-bearing steel hop backs, which are about 26 ft. 6in. dia. × 9 ft. deep. In this case pumping takes 8 hr. compared to 41 hr. shovelling.

Originally casks were washed externally by one machine, internally by another and afterwards steam sterilised. The three operations are now performed on one machine, which saves up to 33% in labour on each cask without any increase in power consumption. Casks are also cleaner as a result of the washing water being injected by four consecutive nozzles and the steam by five nozzles.

Smaller vessels are water flushed and steam sterilised, but larger vessels, *e.g.* vats are too large for this treatment. A wooden vat measures about 20 ft. dia. and is 22 ft. deep. Before each filling they are scrubbed thoroughly by three men, two with long-handled brushes and a third with a hose. Now, as the vats fall due for renewal they are being replaced by stainless steel vessels which lend themselves to mechanical washing by medium pressure water and a revolving washer with three nozzles operating in catherine wheel fashion. Using the older method 9 man hours and about 1,000 gal. of water per vat are used in cleaning the oak vats, while with the new method 1 man hr. and about 1,500 gal. of water per vat is used.



MASH TUNS. Picture on the left shows mash tuns being emptied mechanically. This method takes 8 hr. compared to 41 hr. of manual shovelling (*below*).

The Determination of Starch Purity with the Kent-Jones and Martin Colour Grader

By Y. Pomeranz, Chem. Eng.*

IN testing and evaluating starches considerable importance is attached to whiteness of the product as the colour is one of the accepted indices of purity.

Methods for determining starch purity range from visual inspection (speck count, assessment of colour by comparison with standard samples, the stab test, or use of disc colorimetric methods) to the use of various types of photometers. The various methods constitute part of routine analysis,[1] scoring and grading methods[2] and official standards.[3]

The evaluation of colour by visual inspection or by comparison with standard discs is being replaced by newer photometric and spectrophotometric procedures. Visual inspection methods are tedious, partly subjective—the results are influenced by constancy of colour standards used for matching and skill of operator in obtaining a match—and usually demand considerable time to carry out. The most important objection raised against visual inspection is that while the method may be reasonably satisfactory for evaluating a group of samples it is unreliable for making absolute comparisons.[4]

Numerous attempts to measure starch whiteness by means of photoelectric reflectance meters have been reported.[5, 6, 7] All the devices employed proved unsatisfactory as their sensitivity was low and the results were influenced by numerous factors not related to the whiteness of the tested starch.

Recently,[8] the use of a Leukometer in starch purity evaluation was described. The instrument is composed of two parts: a photoelement and a sensitive galvanometer and measures light reflected from the surface of starch. Difficulties encountered in reflectance measurements of starch surfaces are obviated by filling the tested substance into optical glass cells. Provided a sufficient layer of starch is filled into the glass cell, the reproducibility of measurements is reported high. Minor differences were observed due to variations in sensitivity of photocells. The whiteness of starch in the Leukometer is determined by comparison with light reflection from magnesium oxide. As the instrument contains no internal standard, frequent calibration is necessary. "Ageing" of magnesium oxide, light reflection on the glass cell surface and light absorption by the glass are some of the factors which have to be allowed for. The water content was stated to have a profound influence on the colour of potato starch.[9, 10] Visual inspection (Pekar test) is therefore preferably made on a thoroughly wet substance. The "lustre"—the extent of which depends on the water content and particle size—influence reflectance measurements from solid starch surfaces. In whiteness measurements with the Leukometer, the particle size of both the starches and extraneous matter were shown to influence the results.

Table 1. Influence of Wheat Bran Addition on Grade Colour of Wheat Starch

Addition of wheat bran (%)	*Grade colour of wheat starch-bran mixture*
Control	1·8
0·1	2·0
0·2	2·2
0·3	2·6
0·5	3·2
1·0	3·8

Table 2. Influence of Maize Meal Addition on Grade Colour of Maize Starch

Addition maize meal (%)	*Grade colour of maize starch-meal mixture*
Control	−1·7
0·5	−1·7
1·0	−1·4
2·0	−1·3
3·0	−0·8
5·0	−0·2

Operation of the colour grader

The Kent-Jones and Martin Colour Grader is a colorimeter which measures the amount of light reflected from the surface of a water suspension of flour contained in a glass cell. The instrument measures whiteness by comparison of light reflected by a sample with that from magnesium oxide.[11] The use of the flour sample in the form of a paste eliminates the effects of varying granularity; the influence of the yellow oil-soluble pigment of the flour is eliminated by using a special filter system so that practically only the "greyness" affected by bran particles, impurities or any extraneous matter is measured. The green light employed has a wave-length of approximately 530 m. The "brightness" of the flour is measured on an arbitrary scale ranging from minus 5 to plus 18 and covering practically the whole range of flour products. The lower the grade figure number, the brighter the flour. Within the range of the instrument each colour unit is equivalent to a difference in reflectance of 1·75%. The instrument is provided with a working reference standard (a polished vitrolite block fitted into the lower half of the cell holder) and ultimate internal standard. The simple and instantaneous standardisation (prior to each measurement) makes possible line operation, notwithstanding voltage fluctuations.

The instrument and method have been described fully[12, 13] and have found recently wide use in the flour milling industry in England, Canada, U.S.A. and on the European continent.[14] It enables rapid and simple numerical assessment of colour as a single num-

* Head of the Food Testing Laboratory, Haifa, Israel.

ber; the sensitivity and reproducibility of results are high. The results of colour grade determination were found practically unaffected by degree of fineness or colour of bran particles, by granularity of flour, or by natural or artificial bleaching of flour.

On testing flour a paste is prepared by mixing 30 g. flour with about 50 ml. of distilled water (the exact amount depends on the water absorption capacity of the flour) in a glass beaker. Provided the time of mixing and temperature are reasonably controlled and a smooth, pourable paste is obtained, the reproducibility is very good and experienced operators normally check within 0·2 instrument units.

In order to determine the value of assessing starch colour with the Colour Grader (Series 11), 40 samples of local and imported starch were tested. The range of the instrument scale was found sufficient to cover all types of starch which may need to be tested. To obtain the right consistency of starch pastes it was found suitable to mix 40 g. of starch with 40 ml. of water. The experimental error was small and the same starch tested on the instrument several times gave a colour value within ± 0·1 units.

Comparative placing of various starches by the instrument and by careful visual inspection—of speckiness and "greyness"—showed a highly significant correlation. Actually, the instrument indicated colour differences revealed on visual inspection only by an experienced operator. Differences of less than 0·5 units were hardly detected by eye, especially if samples showed variable granularity, lustre, or if the starches contained various amounts of a natural yellow pigment.

Commercial cereal starches—wheat, white and yellow maize—of acceptable colour registered generally grade colour figures between minus 5 and zero; potato and sweet potato starches had normally grade figures as high as plus 5, whereas sorghum and sweet potato starches of inferior colour showed grades of 10 and over. Commercial methods of bleaching had a profound effect on the grade colour of starches as shown on a series of samples of sweet potato starch (raw and bleached). An essentially linear relationship was found between grade colour readings and the amount of finely ground wheat bran added to wheat starch or whole-meal (Colour Grade above 18) admixed to pure maize starch.

Samples of starches submitted by four local manufacturers in order to establish grade colour limits for various starches were in keeping with previously given data and added confirmation to the value of the instrument in assessing purity of starches.

REFERENCES

1. H. Wegner, *Die Stärke*, 1955, **7**, 185. C. A. Brautlecht, Starch: its sources, production and uses, Reinhold, 1953, p. 331.
2. E. Lindeman, *Die Stärke*, 1952, **4**, 109.
3. Indian Standard DOC;CDC 21 (608). Standard U.S.S.R. NKPP 258.
4. Crop Bulletin 57, Grain Research Laboratory, Board of Grain Commissioners, Canada.
5. A. Parlow, *Ztschr. Spirit. Ind.*, 1933, **56**, 280.
6. G. Steinhoff, *ibid.*, 1934, **57**, 1.
7. H. Tryller, *ibid.*, 1938, **61**, 9.
8. H. Wegner, *Die Stärke*, 1953, **5**, 209.
9. G. Steinhoff, *Ztschr. Spirit. Ind.*, 1934, **57**, 158.
10. A. P. Schulz, *ibid.*, 1932, **55**, 35.
11. A. W. Croes, *Chem. Weekbl.*, 1956, **52**, 431.
12. D. W. Kent-Jones and W. Martin, *Analyst*, 1950, **75**, 127 and 133.
13. D. W. Kent-Jones, W. Martin, R. A. Scott and D. G. Elias, *Chem. and Ind.*, 1956, 105.
14. E. Staudt, *Die Mühle*, 1956, **16**, 105.

Dutch Sugar Dryer

(*Continued from page* 369)

low the louvres is divided into several compartments.

This close contact between the particles of sugar on the louvres and the air ensures rapid and uniform drying.

Since the sugar is conveyed in a partly fluidised state, the fine sugar dust can be separated from the larger crystals and this is conveyed by the humid air to the air hood B above the chute. Exhausted from the hood by the fan F, this air, on its way out, passes through the cylindrical wet dust catcher C, in which the fine particles of sugar dust are collected in a screen of water or in a diluted sugar solution. This sugar solution, of which the concentration gradually increases, can be pumped to the liquor station, fresh water then being substituted for it in the dust catcher.

Under this new drying and cooling system the damage to crystals has been found to be considerably reduced and is not more than that normally experienced with grasshopper conveyors; separation of the dust and its return in solution to the juice tanks is possible; little space is required resulting in economy in building or rebuilding costs, while the new plant can usually be installed in line with the centrifuges; heavy foundations are unnecessary, and first costs and maintenance expenses are comparatively low.

Skuse's Complete Confectioner

(*Continued from page* 368)

sive listed proportions in many chapters of the book. Although the flavouring of a confection is a matter for empirical test, it is useful to have at hand a basis from which to start. Incidentally, one must agree that good oils and essences are the cheapest, and certainly the most satisfactory; they can make or break a product.

The notes and table on pp. 330 and 331 relating to the effect of hardness of water on the amount of cream of tartar required for cutting the grain are worthy of especial attention by all confectioners, and particularly those specialising in this method of "doctoring." Variations of water hardness should be taken into consideration. The reference to the utilisation of waste on p. 319 will be of considerable interest to confectioners concerned with waste from high boiled sugar goods with an acid content.

This thoughtfully revised edition of Skuse's book of formulations should be in the library of every confectioner. He cannot fail to extract ideas from it which might lead him to produce a type of confection somewhat different from those of his competitors, to his ultimate benefit.

C. T. WILLIAMS.

WHEN THE MANUFACTURER IS LIABLE

By Lord Meston

THE distributor is not always liable for injuries suffered by customers through some defect in the goods sold. Why should he always be liable? Take the famous case of the retailer who sold ginger beer in an opaque bottle which was stoppered and sealed. The bottle contained a snail, the decomposed remains of which became mixed with the ginger beer, which was drunk by the consumer and caused her harm. What could the retailer have done to avoid such a horrid thing happening? No amount of external examination would have been of any use. No one would suggest that every bottle of ginger beer should be opened and analysed and then closed again and sold to the public—incidentally, the "fizz" would go out of it. In this case there was no contract between the manufacturer and the consumer, but the manufacturer was held liable on the ground of negligence.

There are indeed many cases in which liability rests on the manufacturer and not on the distributor. In the first place the manufacturer has a duty in *contract* to the buyer under Section 14 of the Sale of Goods Act, 1893, which provides in terms that, unless the goods are sold under a patent or trade name, there is an implied condition that they are reasonably fit for the purpose for which they are sold. There is also an implied condition that the goods are of merchantable quality. But unless the buyer of the goods (*e.g.* the retailer) is also himself the person who suffers damage from the goods, there is no contractual liability to the consumer or user.

Then we consider the position in "tort," which means a civil wrong (*e.g.* negligence, nuisance, trespass) as distinct from a breach of contract. It frequently happens that goods pass through many hands after they leave the manufacturer before coming into the possession of the consumer or user. In "tort" the manufacturer may be liable to the consumer or user though by no conceivable stretch of imagination can it be said that there is any contractual relationship between such parties. In this connection the duty of the manufacturer is to take reasonable care in the manufacture of his product, and failure to take such care will render him liable to any consumer or user whose person or property is injured by his product, provided (1) the product causing the injury has the same defect as it had when it left the manufacturer; and (2) the manufacturer contemplated that the product would be consumed or used in the same condition as it was in when it left him.

The manufacturer's duty is not limited to these parts of his product which he makes himself. It extends to component parts, supplied by his sub-manufacturers or others, which he uses in the manufacture of his own products. Suppose, for instance, that a manufacturer of a motor-car sells a car to a dealer and the dealer sells it to a customer. While the customer is using the car it collapses through one of the wheels being made of defective material. The wheel has not been made by the above-mentioned manufacturer but has been bought by him from another manufacturer. In that event the first-mentioned manufacturer (*i.e.* who sold the entire car to the dealer) may be liable to the customer for the damage that arose through the collapse of the wheel.

Containers

Furthermore, the manufacturer's duty extends not only to his product, but also to any container in which he packs his product for the purpose of sale. If he does not himself manufacture the container he must take reasonable care to see whether it is fit for its purpose before he delivers it to his buyer. Suppose, for example, that a manufacturer of ginger beer places the beverage in a bottle which has been made by someone else. When the ultimate purchaser of the bottle opens it to consume the ginger beer the bottle bursts and injures the consumer. In such a case the manufacturer may be liable on the ground that he must have contemplated the bottle being handled immediately by the consumer, and therefore the manufacturer owes a duty to the consumer to take care that he will not be injured externally by explosion just as he owes a duty to the consumer to take care that he will not be injured internally by poison.

Labelling

The manufacturer has a duty to take care in the labelling of his product. Suppose that a person manufactures two different articles, one being a deadly poison and the other safe, and through a careless blunder labels as safe an article which he ought to have known was in the poisonous category and sells the article in question as "safe." In those circumstances the manufacturer would clearly be liable to users of the article.

Instructions for use

The subject of labels leads us to consider the necessity in some cases of giving proper instructions as to how certain goods should be used. Goods may be dangerous when used for a particular purpose unless certain precautions are taken. For example, a drug may be perfectly safe if properly diluted, but dangerous if taken without being diluted. In such a case it is the duty of the manufacturer to deliver adequate instructions for use with his product. It is not enough that there should be some

instructions, but there must be adequate instructions. Therefore, manufacturers of a cattle dip, who negligently label the dip, so that when the labelled instructions are carried out the dip is insufficiently diluted and cattle are injured, may be liable in negligence to the buyers. It is frequently in connection with hair dyes used on human beings that this type of thing occurs. Where manufacturers of a hair dye know that their dye is dangerous if used on a person without a skin test and sell it to a hairdresser without warning him of the necessity of a test before use, the manufacturers may be liable to one of the hairdresser's customers who develops dermatitis as a result of the application of the dye. On the other hand, when a manufacturer of a hair dye supplies the dye to a hairdresser in labelled bottles together with a brochure of instructions, both of which contain a warning that a test should be made before use, and no test is made, the manufacturer will not be liable to one of the hairdresser's customers who contract dermatitis. In such a case the adequate warning that is given to the hairdresser is enough. It would be unreasonable and impossible to expect the manufacturer to give warning in such a form that it must come to the knowledge of the particular customer who is to be treated. Even the manufacturer is entitled to protection sometimes.

Surface Heating Techniques for Essence Manufacture

A WIDE range of synthetic flavours —including allyl caproate (pineapple), ethyl caproate (cognac), amyl butyrate and ethyl butyrate (pineapple)—are made by the Birmingham Chemical Co., Ltd., at their works in Lichfield, near Birmingham. To overcome the difficulty of handling extremely heat-sensitive materials, electric surface heating techniques are used to a large extent.

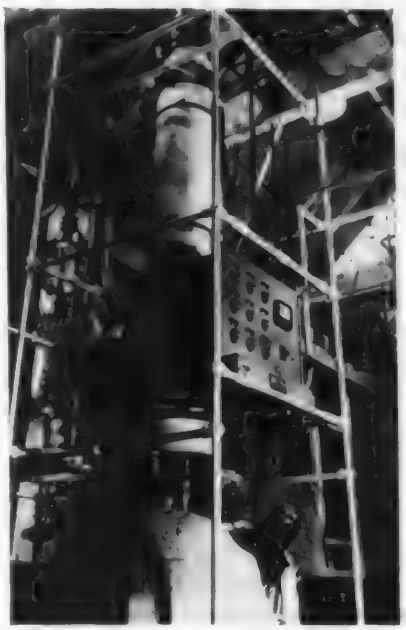
The esters are made in vacuum fractionating units. These consist basically of a glass flask in which esterification takes place, and a glass distillation column rising from it.

In general, for the manufacture of esters the appropriate alcohol and organic acid are admitted to the flask. The reaction, which is accelerated by the addition of catalysts, must be conducted carefully with strict temperature control.

The reaction cannot proceed to completion; and in the next stage the reacted and unreacted materials must be separated by fractional distillation.

Precise temperature control is obviously essential for the complete separation of each component in a pure state, and the heat-sensitivity of many of the products handled also demands a form of heating capable of strict regulation.

To meet these requirements, the flasks and columns are heated by accurately controlled electric surface heaters, made by Isopad, Ltd. In these units the heat is applied by electric resistance elements which are either interwoven with high-temperature glass yarn, or are fitted to tough industrial glass cloth of a special weave. This type of heater has the advantage that the heat at any given point can be of fairly low intensity, since it is spread over the entire surface to be heated. Consequently there are no "hot spots" which can damage the contents of the flask or the glass itself.



Isomantle control panel for individual adjustment of the elements in the flask and column heaters. The thermometer indicates the temperature at various selected points.

The distillation column heaters consist of two heating jackets, the upper having a loading of 750 watts, the lower a loading of 900 watts, both with built-in insulation. They are connected in parallel, the different wattages providing the required temperature gradient. Of rigid construction, they are split longitudinally and hinged on one side, so that they can be opened for mounting and removal, and are held in place by metal straps. The units shown have outer enclosures made of glass cloth, but similar units are provided with sheet metal shells. They are made in sizes ranging from 12 in. long by 1 in. bore, up to 5 ft. long by 5 ft. diameter.

The control panel illustrated is the heart of the whole system. The dial thermometer on the right is connected by a rotary switch to thermostats placed at strategic points in the various elements, so that the operator can tell at a glance the heat gradient and actual temperatures throughout the installation. The nine control knobs provide individual variation of power input to the various elements. The six on the left are for the six elements in the flask heater, the upper two on the right-hand row are for the upper jacket, and that on the lower right adjusts the two column heaters. On this still, the required maximum temperatures vary from 70°C. to 130°C. for the various esters.

All the heaters used here are standard units, from a range designed to cater for practically all types and sizes of standard glass plant.

Advances in Food Technology

GLUCOSE

Enzyme Action in Cellulose

In the course of research carried out at the Technological Institute for Agricultural Chemistry, Budapest Technical University, the attempt has been made to clarify the mechanism of enzyme decomposition. Enzyme preparations were obtained from different sources. An active cellulose, obtained from the hepatopancreas of *Helix pomatia*, was able to produce glucose as a final product but its fractions were not able to produce cellubiose or other holosaccharides, even by precipitation with acetone. For research on small-scale cellulase activities, cellulose flocks were dissolved in 42% supersaturated hydrochloric acid and precipitated by dilution with water. It was found that their hydrolysation can be about 40 times quicker than that of native cellulose.—J. Hollo and Anna Szilagyi, *Industries Alimentaires et Agricoles*, 1957, **74**, 13.

MEAT PRODUCTS

Accelerated Curing by Electric Current

Following up an American suggestion, Polish research workers have used controlled alternating current to accelerate meat curing. They found that a.c., so controlled as to avoid any temperature rise in the brine, modifies the physico-chemical conditions of the curing process. There is an increase in the contents of nitrates, nitrites and salts as well as in the weight yield of the meat, proportional to the voltage applied. Electric current permits an appreciable reduction in the curing time. For instance, an alternating current of 24 volts and 1 amp. reduced the normal immersion curing time by one-third. This allows better utilisation of the technical equipment of the curing houses. The large-scale application of the principle will mainly depend on the means that can be devised to ensure a satisfactory passage of the electric current through the brine. —W. Pezacki and J. Kuczynski, *La Revue de la Conserve*, 1957, February, 75.

CANNED HAM

High Frequency Processing

Attempts are being made at the American Meat Institute Foundation to perfect a thermatronic process for producing commercially sterile but not over-processed hams.

Accurate temperature measurement and control are essential but presented mechanical and electrical difficulties. In addition, penetration of the ham's surface by shielded thermocouples would increase the difficulty of flash sterilising the surface after transfer of the product to the can. The only other point of measurement was in the juice from the ham which fills the processing cell above the expansion plate electrode and even here the thermocouple had to be shielded from the electrical effect.

Measurements of temperature *versus* time were made in juices from a ham with the shielded thermocouple apart from the generator and retort assembly. A limiting temperature of 260°F. was chosen and curves for different heating rates plotted from the data obtained in the hope that they would enable the operator to predict the end-point.

Readings between the shielded thermocouple readings were then correlated with the average temperature of the ham obtained at the end of the run. However, the deviation of the correlation was less than the difference between the maximum and minimum temperatures in the temperature profile of the ham obtained at the end of the run. In most runs a few readings in the centre were low compared to most of the others. It was also noted that this low tempature region coincided with the region of the ham which had been folded into the bone pocket. Even when low readings were obtained in positions other than the centre, the presence of fat pockets was indicated which lost part of the fat from melting during processing.

A processing technique allowing the temperatures to equalise by means of current control and agitation of the cell is now being used. Improved calculations of minimum, average and maximum °F. are being made to establish closer sterility and overprocessing indices.—L. J. Pircon, P. Loquercio and C. Francik, *Annual Report, Am. Meat Inst. Found.*, 1956, **31**.

CANNED FOOD

Chromatographic Detection of Preservatives

At the Food Canning Research Institute at Palermo, Sicily, simple chromatographic methods have been developed for the detection of several preservatives in canned foods. The antiferments concerned can be extracted from the can by means of a single solvent which is chromatographically examined. The stains are applied on two sheets of Whatman paper, and two different solvents are then applied. Each sheet is cut into three strips containing the stains of the extracted solution and the standard solution, and is sprayed with the appropriate identification reagent. In this way, it is possible to identify benzoic acid, monobromoacetic acid and its esters, monochloroacetic acid, *p*-chlorobenzoic acid, *p*-oxybenzoic acid and its five more usual esters, and salicylic acid.—G. Safina, *Conserve e derivati agrumari*, 1956, 191.

Machinery and Equipment

FLEXIBLE FURNACE

A versatile 1,000°C. surface heater, known as the *Flexible Furnace* has been developed by the Electrothermal Engineering Co., Ltd. This heater is built up from a network of resistance wires insulated by interlocking high temperature resistant ceramic blocks. These give the heater a degree of flexibility which, say the makers, allows it to be applied to pipes of ½-in. diameter. Curvatures with a minimum radius of 24-in. can be accommodated in a direction at right angles to the direction of maximum flexibility. The heater has a surface loading of 50w/sq. in.

Rectangular heaters can be supplied in sizes up to 48 in. × 48 in. and in other shapes.

PEA VINER

The Mark XII *Super Viner*, has been developed by Mather and Platt, Ltd., to handle all varieties of pea vine, pea pods and broad bean pods producing from 25 to 30 cwt. per hr. of shelled peas from 4 to 7½ tons per hr. of vines. When fed with pea pods only, the machine is capable of an output of 40 cwt. It can be rapidly adjusted while the machine is operating.

This machine incorporates a quick-release flap fitted on the elevator, a tapered beater and riddle drum, remote controlled beater blades, the angle of which may be adjusted while the machine is running, and a variable speed gear which is fitted to the beater drum. The chain drive to the riddle drum gives full control of the vine while it is being thrashed. The apron is stated to give a good separation of peas and waste. It is further claimed that the transmission is primarily through chains ensuring simplicity and low maintenance costs.

VOLTAGE REGULATOR

Miniature automatic tap changers for electrical equipment have been developed by Claude Lyons, Ltd., which they say, provide an inexpensive, compact and reliable method of bringing widely varying mains voltages within limits acceptable for most types of electronic and electrically powered equipment. The output waveform is undistorted and the device is independent of frequency.

Many electronic and electrical devices begin to operate incorrectly when the mains voltage varies more than about ± 5% from the "nominal" or rated input voltage value, and variation also tends to reduce the life of electronic components, particularly valves. This is usually counteracted by providing the devices with input transformers or dropping resistors having a voltage selector switch or plug which gives a choice of three or more input settings. But often the random fluctuations of the mains are large enough to require the taps to be changed during operation—which is inconvenient at any time and impossible with unattended equipment.

The automatic tap changer is designed so that the output voltage always remains within ± 5% of the declared value for input changes of as large as −20% to +10%. The transformer is provided with three output taps and two relay-operated microswitches select the appropriate tap to be used. The relays are operated by an electronic sensor unit which compares a rectified sample of the input voltage with a stable reference voltage produced by a miniature voltage regulator valve. The efficiency is high since the electronic "brain" only consumes about 15 watts.

FIRE VENTILATORS IN ACTION

A practical demonstration of Colt Ventilations' fusible link ventilators at Uxbridge recently. In the roof of this building—representing three bays of a factory—were three Colt dual purpose heat and smoke exhaust vents, which can just be seen through the smoke. When the fire temperature reached 158°F. links holding the ventilators' louvres shut fused, and the ventilators opened fully, allowing the smoke to pour out of the roof. The fire could then have been put out comparatively easily but was allowed to burn for 30 min. to test the "Asbestolux" and "Rocksil" lining of the roof and walls.

HYGIENIC PIPE FITTINGS

A drip-proof plug cock is the latest in the range of stainless steel hygienic pipe fittings manufactured by the Realm Engineering Works, Ltd. It has been designed for easy dismantling for cleaning and is glanded to prevent any loss of liquid from the line. Like all Realm plug cocks it has an electro deposit of hard chrome which is deposited on the plugs prior to grinding and lapping so as to eliminate any tendency to seize.

Fittings made by this company are supplied in two different ranges; I.A.M.D. (3A) the American metal-to-metal cone seat joint and B.S.S. 1864: 1952, the British dairy, etc., rubber ring joint. Both ranges are available for silver brazing or for expanding on to the pipe or can be supplied with plain recessed ends for sweating direct on to the pipe.

TELESCOPIC STACKER

The Sherpa VII telescopic stacker made by Salisbury Precision Engineering, Ltd., can be supplied in three versions capable of lifting 10-15 cwt. to 10-15 ft. on 24-36 in. forks. Each of these can be either battery or mains operated.

It is rigidly constructed from heavy gauge mild steel channel and angle electric welded throughout. The 6 in. dia. cast iron front rollers are arranged in tandem to over-ride floor irregularities. The steerable tow-bar assembly at the rear, is fitted with 8 in. dia. cast iron wheels, and stabilising castors are mounted on the extreme corners; all wheels run on roller bearings.

The control box contains the complete electro-hydraulic unit and conveniently placed controls on the top panel are push-button for lift, and release valve for infinitely variable speed lowering. A three-pin socket for charging the 12 volt 124 amp./hr. battery is also fitted. An electric limit switch controls the maximum height of lift and prevents overloading the pump.

The specifications of this machine are as follows:

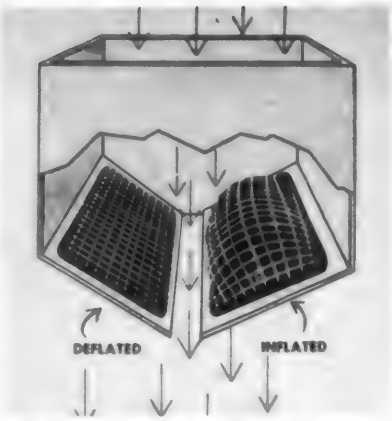
Overall height	91 in.	2311 mm.
Overall width	49 in.	1245 mm.
Overall length	56 in.	1422 mm.
Battery capacity	12 volts at 124 amp./hr.	
Number of lifts to full height at maximum load per charge 80.		
Net weight 8 cwt., 410 kg.		

FACILITATING FLOW IN BINS AND HOPPERS

PneuBin is a device now being used in industry for alleviating flow problems of bulk materials ranging from fine powders to coarse granules. The *PneuBin* unit consists of steel-backed, neoprene, pulsating panels mounted on the inside wall of existing or new bins, plus air controls to regulate the panel's action. By the pneumatic inflation and deflation of the panels, the bin contents are stated to be positively displaced to ensure free flow. After the panels have deflated, the air control unit (operating off the regular plant air supply) starts another cycle of inflation and deflation. The process continues automatically at whatever frequency is set on the air controller (this frequency is adjustable).

The panels are available in fourteen different sizes ranging from 4 in. x 12 in. to 24 in. x 72 in. On the back of the panel are standard nut mounting bushings and air inlet coupling. To mount panels in hopper, holes are drilled and the panel held in place by means of studs or other fastening devices. The central air inlet is a standard pipe coupling and all manifolding, etc., is outside of the hopper.

Controls to actuate the various panels are available in three different sizes, with the basic difference in the two smaller controls being air capacity. The size required depends on the size of panel being used and the number of bins in an installation. One control can actuate panels in several different bins, if required. The largest control available incorporates flexibility of panel action in that the panels can be operated in unison or in sequence.



Pulsating panels in a V-bottom bin.

PneuBin can be utilised in various basic bin designs, such as pyramidal, conical, V-shape, and catenary. No restriction of bin material of construction is necessary. The size of the installations vary from very small hoppers holding a few pounds of material to bins and bunkers holding hundreds of tons of material.

The panel locations as shown would be typical of that as used in a V-bottom bin to alleviate flow difficulties of both bridging and funnelling. Sole concessionaires for the U.K. are Paterson Hughes Engineering Co., Ltd.

"Sherpa" telescopic stacker.

MACARONI MACHINES

Machinery by Braibanti for the manufacture of macaroni and similar products aroused special interest at the recent Milan Fair, reports our Rome correspondent. They included the *Teless* for drying noodles and other types of short edible paste goods and the *Macrimat* for macaroni manufacture.

The *Teless*, which is supplied in various sizes according to the capacity required, is a continuous drier. Horizontal strips of nylon prevent contact of the paste with the metal parts of the machine. A special system of suspension and moving keeps these strips in the horizontal position regardless of the load to which they are subjected.

The essential feature of the *Macrimat* consists of two independent compression screws which feed two drawing heads. The machine is used in conjunction with double skeining and nest making machines or with drying chambers. It is claimed that the use of this machine eliminates the diffusion of T-shaped or V-shaped tubes: linear distribution of the threads of paste is ensured by means of twin mushroom-shaped devices.

The *Macrimat* is equipped with two dough-mixing units one of which feeds the two compression screws. The latter works under vacuum and functions on the gravity principle.

LEVEL CONTROL

A level control developed by Lancashire Dynamo Electronic Products, Ltd., is claimed to be one of the first truly industrial applications of transistors. The equipment is completely transistorised and uses printed circuit techniques. It is applicable to the control of the level of a wide range of liquids, granular and powder substances in almost any type of container, claim the company. It is said to be particularly easy to instal.

The equipment operates on the principle that the change in capacitance at the probe or other electrode in the container due to the presence of the material under control causes the operation of a relay in the main unit. This relay can be used for control or indication purposes as desired. A number of versions of the main unit will be available to meet requirements of high and low level and various combined forms of control. A common basic form of probe head is used in all applications.

With much of the circuit housed in the probe head attached to the container, only two connections plus earth are needed between the head and the main unit. These connections can be made any desired length and there are no special requirements as far as the cable is concerned. The maximum potential involved on the connecting cable is 12 volts with consequent safety in hazardous locations.

News Digest

Distribution payments for sugar

The surcharge on sugar has been suspended and the Sugar Board has begun to make distribution payments instead. This will mean lower sugar prices.

The Minister of Agriculture, Fisheries and Food on the advice of the Sugar Board has made the necessary Orders and Regulations under sections 13 to 16 of the Sugar Act, 1956.

Distribution repayments, payable to the Sugar Board, are also introduced from the same date on goods which become entitled to drawback of sugar duty (*e.g.* on export) and which have received the benefit of distribution payments.

The rates of distribution payments and repayments are available on application to the Ministry.

The surcharge which has now ceased was equivalent to about ¼d. per lb. on refined sugar and the distribution payments are equivalent to about ¼d. per lb. on refined sugar.

Under the Sugar Act, 1956, the Sugar Board purchase the negotiated price sugar the U.K. undertakes to buy under the Commonwealth Sugar Agreement and re-sell it at open market prices. The Board also have financial links with the home beet sugar industry. The Board are required to balance their accounts taking one year with another. If the Board would otherwise be in deficit, a surcharge is collected at the duty point on all sugar and molasses (including the sugar and molasses content of imported manufactured goods) which are charged with sugar duty.

On the other hand any existing surcharge can be suspended and distribution payments (or "surcharge in reverse") introduced. Because of the continuing high level of the world price of sugar, which exceeds the negotiated price for 1957 under the Commonwealth Sugar Agreement, a surcharge is no longer required to enable the Sugar Board to balance its accounts. Instead the Sugar Board's financial position and prospects are now such that distribution payments can be introduced.

Food colours regulations

The Colouring Matter in Food Regulations 1957 have now come into effect, and have been published as S.I. 1957 No. 1066 (H.M.S.O. 5d. net).

The regulatians prescribe a list of permitted food colours. They prohibit the importation and sale of food containing colouring matter not on the permitted list and, subject to an exception in the case of citrus fruit if the fruit is clearly marked on the skin with the words "colour added," the addition of colouring matter to certain natural foods sold in a raw and unprocessed state.

Colouring matter and colouring and flavouring compounds sold for use in food are subject to special labelling requirements.

Customs Officers will afford facilities to Food and Drugs authorities, port health authorities and public analysts for the examination of cargoes and consignments before they are cleared by Customs; but no sampling of uncleared goods should be undertaken without the consent of the Customs Officer.

The list of permitted colours prescribed by the regulations include a number of colours of natural origin and 30 other colours. The list as a whole will be reviewed in five years' time. Meanwhile individual colours may be added to or removed from the list, if further information becomes available.

The regulations will come into effect by stages, beginning immediately, and will be fully operative by June, 1959. They apply to England and Wales only, but corresponding regulations for Scotland will shortly be made by the Secretary of State.

Egg marketing scheme in full swing

Responsibility for marketing all eggs in Britain was taken over by the British Egg Marketing Board on July 1. For the past 17 years all trading in eggs was undertaken by the Ministry of Agriculture.

Although the formation of the new Board was approved by a big majority of poultry farmers taking part in a nation-wide poll, there has been strong and vocal opposition to the scheme. Most of the objections to the scheme are extremely involved but they are principally directed towards its compulsory nature—the Board will control the marketing of nearly all eggs from producers with flocks of 50 birds or more and will administer the egg subsidy.

One objector asked, "What is the view of the Monopolies Commission on the Scheme?" In fact, however, the Board does not have any powers to restrict production and will not therefore be able to exercise any appreciable monopoly power over the price of eggs.

An introductory publicity campaign for British eggs is already under way and plans for a full-scale drive are being made. The "hall mark" which will in future be stamped on all British eggs will appear in all the Boards advertising literature.

Minister will open Corrosion Exhibition

Mr. Harmer Nicholls, Parliamentary Secretary, Ministry of Works, will officially open the Corrosion Exhibition on October 15. The Exhibition, sponsored by *Corrosion Technology* magazine and the Leonard Hill Technical Group, will run for three days—October 15, 16 and 17, at the Old Hall of the Royal Horticultural Society, Westminster, London, S.W.1.

All space at the Exhibition has now been sold. More than 50 firms, leaders in their respective fields, will be showing a wide and interesting range of anti-corrosion products, processes and services.

Concurrently with the Exhibition, a Corrosion Convention will be held at the Central Hall, Westminster. The programme for this has been finalised. All interested in corrosion prevention in industry are invited to register as delegates. Application forms are obtainable from the Organiser, Corrosion Convention, Stratford House, Eden Street, London N.W.1.

Batchelors change their name

Batchelors Peas, Ltd., have changed their name to Batchelors Foods, Ltd., to cover their new range of food products. Announcing this at Ashford, Kent, Col. Maurice W. Batchelor, the chairman, said "Our reputation was founded on peas, and we shall continue to can them on the widest possible scale. We have already added some 20 other prepared foods to our range . . . and I foresee further wide expansion when the rich harvest of the Kent area comes into our new factory."

"Mornflakes" for S. England

Morning Foods, Ltd., have appointed Palmer Mann and Co. Ltd. (*Sifta Salt*) as their sole selling agents for packeted *Mornflake Oats* in the southern part of England. This comprises an area south of a line from Bristol to the Wash. The agency applies only to *Mornflake Oats* in packets; consumer and trade prices will remain unaltered.

Prison becomes fish store

A cold storage for fish in part of the old prison at Bodmin, Cornwall, is being set up by Mr. William Kendall, of the Grimsby firm of fish merchants. The fish will be kept there for distribution to retailers.

Part of the administrative and hospital block of the old prison has been adapted to keep in cold store up to 2,500 stone of fish, which will be fresher and in better condition when sold in shops.

He is also seeking to stimulate the pilchard trade possibly by preparing pilchards in frozen packs ready for the housewife's use.

Gas industry expansion

New gas-making plant to the extent of 28 million cu. ft. capacity was brought into use in the last quarter of the 1956-57 year. This made the total capacity of new plant completed during the year up to 105 million cu. ft. compared with 104 million cu. ft. in the previous year.

New transparent wrappings factory

Transparent wrappings for the food industry are being made in a new factory opened at Dundee by Low and Bonar, Ltd. This old-established Dundee textile firm has been developing packaging interest over a period of years and had previously established similar packing interests in Canada. The factory is a completely modern unit equipped with the most recent plant for the manufacture and printing of transparent wraps.

Plastic packs—new manufacturers

Plastic Packaging, Ltd., is the name of a new private company owned jointly by John Waddington, printers and carton manufacturers, and Mono Containers, paper food container manufacturers.

The company, which has a capital of £10,000 will manufacture containers from polystyrene, polyvinyl chloride, etc. Machinery has already been installed for making plastic sheet material and it is expected that the container manufacturing plant will soon come into operation at the company's new factory in Leeds.

SMEDLEY'S NEW HEAD OFFICE

Smedley's entire administrative team is now housed under one roof at these new premises in Whyteleafe, Surrey. Regional offices have been closed down. The site is some 20 miles from Central London and accommodates a new 400-ton, quick-frozen food store in addition to the administrative buildings.

Infant foods factory to be extended

Farley's Infant Food, Ltd., Plymouth, are hoping to start building their new factory extension in the autumn. The scheme is expected to take about two years.

The new building, which will contain all the most up-to-date machinery, will double the size of the existing factory and will greatly increase the firm's output.

The Farley factory was erected in 1932. It was extended in 1938 and now employs over 400 people.

The firm was originated in 1912 by the late Mr. E. E. Farley, a baker in Ebrington-St., Plymouth, who used to make babies' rusks for a Plymouth doctor to his own recipe. Mr. Farley acquired the recipe and began to manufacture the rusks. Later he emigrated to Canada (where he died only a few years ago) and the business was taken over by the late Mr. W. B. Trahair.

Erections and Extensions

Allied Bakeries, Ltd., are having a modern bakery erected in Hucknall Road, Nottingham.

*

Brooke Bond and Co., Ltd., are having a warehouse built at Cumberland Road, Bristol.

▪

Clyde Cooperage Co., Ltd., barrel and cask makers, are extending their factory in Eastvale Place, Glasgow, C.3.

▪

Bentleys Bakeries, Ltd., are planning alterations and additions to their bakery at Beaumont Road, North Ormesby, Middlesbrough, Yorks.

▪

The Nestle Co. Ltd., are considering plans for the erection of a milk products processing factory at Dalston, Carlisle.

▪

Langley Mill and Aldercar Co-operative Society, Ltd., have opened a new pork factory at Langley Mill, Nottingham.

Dairy Produce Packers, Ltd., are planning to have a factory erected on a one-acre site at Brislington Trading Estate, Bristol.

▪

Cadbury Brothers, Ltd., have had plans approved for the erection of a distribution centre on a site at Potterhill Goods Station Yard, Paisley, Scotland, at an estimated cost of £298,000.

▪

T. Wall and Sons, Ltd., are planning the erection of a distribution depot for ice cream and other foodstuffs at Drakemire Drive, Castlemilk, Glasgow, and a depot at Baginton Road, Coventry.

▪

Towers Creameries, Ltd., margarine manufacturers, have had plans prepared to build an extension to their factory a Commonside East, Mitcham, Surrey.

▪

The Ulster Farmers' Bacon Curing Co. (Newry), Ltd., Newry, Armargh, N. Ireland, have had plans approved top build a factory at Lisdrumgullion.

* *Make sure of receiving*

FOOD MANUFACTURE

regularly

FOOD MANUFACTURE provides a complete service of practical technical information for food manufacturers and technologists, plant engineers, and executives concerned with the manufacture and handling of the following products : bread and flour confectionery, baking and other powders, preserves, jams, jellies, sugar confectionery, chocolates, butter, cheese, ice cream, fruit juice preparations, beverages, canned foods, quick frozen foods, dehydrated foods, meat and fish pastes, cereals and breakfast foods, dried fruits, pickles and sauces, dressings, concentrates, fats and oils, sugar, spices, colours and flavourings, and mincemeats.

For the manufacturer and technologist, FOOD MANUFACTURE describes the latest developments in research analysis, formulation, raw materials, instruments, and apparatus. For the production manager, it records developments in food processing plant and manufacturing techniques, and for the executive, it reports on packaging, consumer demands, and trade policy. Providing a news service of technical progress all over the world, FOOD MANUFACTURE is designed to serve the small and the large manufacturer. A panel of specialists collaborates with the Journal's Enquiry Service to help readers with production problems and to advise on sources of supply of plant and materials.

Each month it comprehensively and accurately records current progress in the whole food manufacturing industry which it serves. To keep abreast of these developments, it is essential to read FOOD MANUFACTURE regularly.

ORDER FORM

FILL IN AND SEND TO :—

LEONARD HILL TECHNICAL GROUP
EDEN STREET, LONDON, N.W.1.

Please send me

FOOD MANUFACTURE

for 1 YEAR £2 10. / 3 YEARS £6 5. Remittance Enclosed

NAME .....

FIRM .....

.....

Manufacturers of .....

.....

ADDRESS .....

.....

.....

.....

POSITION HELD .....

(BLOCK LETTERS, PLEASE)

THE LEONARD HILL TECHNICAL GROUP—

Publish the following monthly journals :

FOOD MANUFACTURE. Refrigeration, Packaging, Pickles and Sauces, Dairy Products, Dehydration, Fats, Sugar, Confectionery, Cereals, Bakery, Fruits, Cordials, Canning and Preserving Meat Products.

Subscription Terms : 1 yr. £2. 10.

WORLD CROPS. Annual, orchard and plantation crops. Grassland management. Cultivation, irrigation and soil conservation. Harvesting and processing. Fertilisers and manures. Control of crop pests and diseases, and of weeds. Farm machinery and equipment. Agricultural economics, research and technology.

Subscription Terms : 1 yr. £2. 10.

MANUFACTURING CHEMIST and Pharmaceutical and Fine Chemical Trade Journal. Proprietary Medicines and Foods, Cosmetics, Soaps, Essential Oils, Toilet Preparations, Dentifrices, Disinfectants, Insecticides, Detergents, Polishes, Veterinary Products and other Chemicals.

Subscription Terms : 1 yr. £2. 10.

PAINT MANUFACTURE. Paint, Varnish, Lacquer, Colours, Plastics, Dyes, Enamels, Printing Inks, Distempers, Oils, Spirits, Pigments and appropriate Raw Materials, Machinery and Plant.

Subscription Terms : 1 yr. £2. 10.

CORROSION TECHNOLOGY. Devoted to the control and prevention of corrosion in all its forms.

Subscription Terms : 1 yr. £2. 10.

POTTERY & GLASS. Deals monthly with problems of production and distribution of tableware and decorative china and glassware. An immaculate production profusely illustrated. An arbiter of " style ".

Subscription Terms : 1 yr. £2.

PETROLEUM. For the petroleum technologist. Production, Drilling, Refining, Distribution, Storage of Oil and Oil By-Products, Petroleum Chemicals and Derivatives.

Subscription Terms : 1 yr. £2. 10.

CHEMICAL & PROCESS ENGINEERING. A monthly international review of chemical plant and operations for all industries.

Subscription Terms ; 1 yr. £2. 10.

FIBRES. A monthly Review devoted to the Natural and Synthetic Fibres and their use in Textiles, Cordage, Brushes, Hosiery, Tyre Cords, Boards and other manufactures.

Subscription Terms : 1 yr. £2. 10.

MUCK SHIFTER & PUBLIC WORKS DIGEST. The role of the civil engineer in overcoming and utilising the forces of nature to the service of man, and a digest written in English of all the latest European and Eastern practice.

Subscription Terms : 1 yr. £1. 10.

ATOMICS (& Nuclear Energy) The first " atomics " journal in the old world. Explains the application of atomics to industry. Essential to progressive firms in all branches of industry.

Subscription Terms : 1 yr. £3.

BUILDING MATERIALS AND FLOORS. News covers all types of Building Materials from traditional materials like stone, brick, timber, glass and plaster to the newer processed and synthetic materials like steel, concrete, non-ferrous metals, various types of building board and all the latest methods of floor construction.

Subscription Terms : 1 yr. £2.

AUTOMATION PROGRESS. Specifically designed to meet the demand for complete coverage of automatic production and control equipment.

Subscription Terms : 1 yr. £2. 10.

TEXTILES IN INDUSTRY. A Monthly Review devoted entirely to the industrial applications of fibres, yarns and woven textiles. Read by men in all industries who are interested in knowing about this fast-expanding role textiles are playing today.

Subscription Terms : 1 yr. £1. 10.

DAIRY ENGINEERING. An independent technical journal renowned for its outspoken editorial comment and authoritative scientific and technical information. It is of paramount interest to all concerned with the production, processing and distribution of milk and dairy products.

Subscription Terms : 1 yr. £1. 10.

9 EDEN STREET, LONDON N.W.1, ENGLAND

PEOPLE

DR. J. A. SCOTT, O.B.E., F.R.C.P., Medical Officer of Health, London County Council, has been appointed chairman-elect of the Royal Society of Health's council. He will assume office on October 1, 1957. Dr. Scott will succeed Prof. Harold Burrow, the present chairman.

■

MR. I. M. O. HUTCHISON, joint managing director of the Balfour Group of Companies, has flown to America for a short tour. After staying in New York he proceeds to Rochester, to attend the annual general meeting of the Pfaudler Co., on behalf of Enamelled Metal Products Corporation (1933), Ltd. (one of the Balfour Group) who manufacture in this country the Pfaudler glass enamelled steel equipment for the handling of beer, wine, spirits, dairy products and mineral waters. Next Mr. Hutchison flies to Toronto to discuss policy and general business matters with Dominion, Scott, Barron, Ltd., a subsidiary company of the Balfour Group.

■

MR. A. W. MARSDEN, M.SC., D.I.C., A.R.C.S., F.R.I.C., director of the Commonwealth Bureau of Dairy Science and Technology, has been appointed organising secretary of the XVth International Dairy Congress to be staged in London from June 29 to July 3, 1959 The Congress is sponsored by the U.K. Dairy Association.

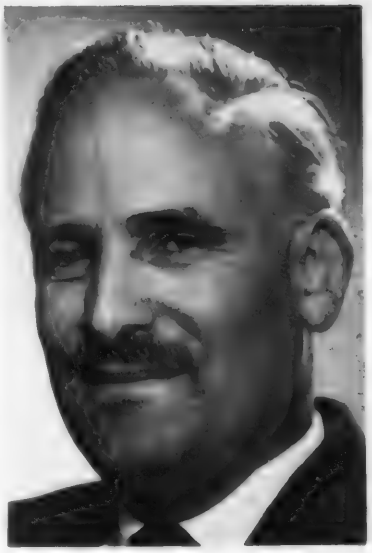
Mr. Marsden was appointed director of the Bureau in 1950 after being on the staff of the Imperial College, London and of Seale-Hayne Agricultural College, Devon. He has been a member of council and of a number of committees of the Society of Chemical Industry, including being chairman of the Agriculture Group, and chairman of the Journals and *Chemistry and Industry* sub-committee and is the technical editor of our associated journal *Dairy Engineering*.

Mr. Marsden takes up his new appointment on July 1, 1957, and Mr. E. J. Mann, N.D.D. at present assistant director, becomes acting director of the Bureau.

■

MR. L. S. MUIR has been appointed general manager at the Craigmillar, Edinburgh, headquarters of T. Wall and Sons (Ice Cream), Ltd. He will be responsible for all aspects of Wall's operations in Scotland, North-East England and Northern Ireland, including production at Craigmillar, said to be Scotland's largest ice-cream factory.

Wall's also announce the appointment of MR. J. R. KINLOCH as a sales manager on Mr. Muir's staff.



Mr. W. B. Chalmers.

MR. W. B. CHALMERS, A.C.I.S., has been appointed director of marketing by Kraft Foods, Ltd. He joined the company on July 1.

Mr. Chalmers began his career in banking, working in Scotland and London. He joined the Thomas Hedley Company in 1944 as a management trainee. After a short period in the U.S. where he worked with Procter and Gamble, he joined Beecham Foods in 1955 as marketing manager. In his new appointment Mr. Chalmers will deal with the marketing of a variety of products. The most important of these are Kraft's American salad dressing, *Miracle Whip; Superfine* margarine; tomato products and various brands of processed cheese.

■

MR. BASIL SHEASBY was awarded the O.B.E. in the Queen's Birthday Honours List. He has just completed 21 years as joint secretary of the National Federation of Wholesale Grocers, and he is also secretary of 12 other wholesale food associations.

B.F.M.I.R.A. elections

Prof. A. C. Frazer was re-elected president of the British Food Manufacturing Industries Research Association at the Association's annual general meeting in London recently. Known internationally for his work on nutrition, he is Professor of Medical Biochemistry and Pharmacology in the University of Birmingham.

Re-elected vice-presidents were MR. J. G. MATHIESON (Clarke, Nickolls and Coombs, Ltd.) and LT.-COL. G. R. HARDING (Aplin and Barrett, Ltd.).

MR. A. C. WILSON (Robert Wilson and Sons (Ulster), Ltd.) did not, for personal reasons, stand for re-election to the council. MR. W. E. RHODES (Chivers and Sons, Ltd.) was re-elected a member of the council, and ten other members retiring on a rotational basis were re-elected.

Prof. A. C. Frazer: re-elected president of the B.F.M.I.R.A.

Obituary

MR. WILLIAM A. CADBURY, former chairman of Cadbury Brothers, Ltd., died in Birmingham last month at the age of 90. A man of whom it has been said "his public record is as varied and as valuable as his modesty is great," William Cadbury did as much as any man to bring the nations of British West Africa into the world prominence which they enjoy today. At the beginning of the century he encouraged farmers in the Gold Coast to plant the cocoa tree, and established buying agencies to provide them with ready money for their crops. Within ten years, British West Africa was growing a third of the world's cocoa, and today Ghana alone is producing over half of the world's supply.

Mr. Cadbury was appointed one of five managing directors when Cadbury's was formed into a private limited company in 1899 and he was chairman of the company from 1922 until his retirement in 1937. He maintained an active interest in the affairs of the company until the time of his death, and two of his sons are at the present time managing directors of the firm.

■

MR. PERCY HARRY OSBORNE a member of the board of Daniel Hipkins, Ltd., fats merchants of Tipton died on June 5, at the age of 57. Mr. Osborne was a Justice of the Peace and chairman of the Community Services Committee of Tipton Rotary Club. He leaves a widow and five children.

Hygiene award

Peerless and Ericsson announce that their *Bruin* automatic tea brewer and dispenser has been awarded the Certificate of the Royal Institute of Public Health and Hygiene.

Long service awards

Seventy-two employees of the Crosse and Blackwell group were presented with gold watches and scrolls by Mr. H. L. Roy Matthews, chairman, in recognition of their long service with the group recently.

The group comprises Crosse and Blackwell, Ltd., James Keiller and Son, Ltd., E. Lazenby and Son, Ltd., Chef Products, Ltd., and Chocolat Tobler, Ltd.

Smedley's sales conference

Smedley representatives throughout the British Isles abandoned their order books recently and migrated to the Smedley National Sales Conference held at Caterham in Surrey. The delegates were welcomed by the chairman of the National Canning Co., Ltd., Mr. Wallace Smedley. The achievements of the past year were reviewed during the conference.

Canning industry criticised . . . by a canner

"Canners have had things too easy for a long time . . . the industry has been slow to adapt itself to new selling methods," according to Mr. P. Firmston Williams, sales director of J. and J. Beaulah, Ltd., at the company's annual sales conference recently. He told his sales staff that they must all work harder if expansion is to continue on the present scale.

Reviewing the difficult trading conditions largely caused by poor summer weather and an unusually mild winter, Mr. Williams said that the usual rush of business in September, October and November did not materialise, though the company's salesmen had exceeded their increased sales target for 1956. Turning to the new season he said that he could not foresee any decline in processed pea prices. "In fact," he said, "there is more likely to be an increase, but probably not a big one."

Tile-like wall finish

A tile-like wall finish is being sold by Tretol, Ltd., under the name *Tylex*, which is claimed to be the complete answer to the need for a very hygienic glazed wall surface in food factories, etc. It is applied like a paint, but the manufacturers say that unlike ordinary paints it does not pick up dirt or "break-down" under atmospheric or chemical attack. The hard abrasion resistant surface can be frequently washed down without losing its glossiness—and there are no joints to retain dirt. It is recommended for use on old or new wall surfaces, in any situation where conditions such as excessive humidity, chemicals, steam, grease and oil would normally demand the use of tiling.

The range of 18 colours, in addition to black and white, is based upon a selection from the British Standards Colours for building range.

Dairy plant cleaners

Six new dairy cleaners have been approved by the Ministry of Agriculture, Fisheries and Food for cleansing dairy plant as an alternative to scalding. They are: *Deosan Dairy Quat* (Deosan, Ltd.), *Lactosan* 66 (Gascoigne-Crowther, Ltd.), *Novamine* (Walter Gregory and Co., Ltd.), *Prinsyl* (Prince Regent Tar Co., Ltd.), *Bactergent* (Cooper, McDougall and Robertson, Ltd.), *Vantoc* D. F. (when used with I.C.I. dairy detergent) (Imperial Chemical Industries, Ltd.).

The approval is given according to the Milk and Dairies Regulations and is set out in Circular FSH 4/57 (H.M.S.O. 3d. net).

Co-op bakery modernisation

The United Co-operative Baking Society, Ltd., is making extensive additions to its various bakeries to maintain their competitiveness with the national combines. At their main McNeil Street, Glasgow, bakery they are installing a 75 ft. travelling oven for batch bread and have added a new flat for cake and teabread. At Clydebank another large travelling oven has been installed in the biscuit factory and work has begun at Perth on the construction of a new bakery to serve the Co-operative Societies in that area.

Soag to sell Adams Powel machines

Soag Machinery Co. are now handling the sales in the U.K. of case gluers and sealers, case tapers, case and can packers, glass and metal container packers and crates, etc., manufactured by Adams Powel Equipment, Ltd.

Sprag clutches for Britain

Renold Chains, Ltd., have been granted a licence by Formsprag Co. of Detroit, U.S.A. to manufacture clutches under *Formsprag* patents.

The major uses for sprag type clutches are to be found in applications involving over-running, backstopping or indexing conditions, where they are said to afford high torque capacity combined with light weight and are in increasing demand for aeronautical, automotive and industrial power transmission purposes.

Compoflex to market rigid tubing

Compoflex Co., Ltd., have extended their flexibles advisory and manufacturing facilities to include certain forms of rigid tubing by the acquisition of the entire share capitals of Rollo Hardy and Co., Ltd., and Tube Making Machines, Ltd. Compoflex say they are the only manufacturers producing plastics, rubber, metallic and composite hoses within the one organisation. The extension of this service to include rigid tubing is claimed to be a logical development.

Both companies will continue their activities and will operate as independent manufacturing organisations at their 40,000 sq. ft. factory at Blaenrhondda, Glamorgan. The two sales organisations, however, have been absorbed into the parent company's new Rigid Tube Division, although the technical services remain at Blaenrhondda. The export departments have been integrated with the Compoflex Export Division. A large-scale expansion programme is planned for the two companies, including modernisation of the Blaenrhondda factory and the installation of new equipment and machinery.

A production expansion of 25% for both companies is planned mainly to cope with the expected increase in export orders.

Colourful overalls

"Fashions" in coloured overalls were displayed by Spring Grove Laundries, Ltd., at the Exhibition of Factory Safety and Hygiene in Birmingham.

Commenting on what is claimed to be an increasing demand throughout industry for more colour, a spokesman of the company said, "In these days a mere feeling of cleanliness is not enough. Why should the protective clothing worn in factories, shops and warehouses, not fit in with the work being done, or the decor of the premises, or indeed, the colour preferences of the employees."

No self-respecting factory girl wanted to wear white overalls when they were first introduced, he said. White was considered ghostly and unbecoming: the proper colour for a lady was black and resentment was only overcome by the payment of a special "overall bonus."

Today Spring Grove Laundries, who specialise in a regular provision of laundered garments of differing colours, sizes and types, have eighteen factories and six depots. They claim that theirs is an "individual" service and intend to hold a series of industrial fashion shows in London and other industrial towns in Britain.

New oil storage installation at Liverpool

A new installation for the storage in bulk of vegetable oils, tallow etc., has been erected on the quayside at East Trafalgar Dock, Liverpool, for A. S. Jones and Co., Ltd., bulk liquid carriers.

The installation comprises 14 tanks, each of 45,000 gal. capacity—a total capacity of 630,000 gal. All the tanks are calibrated to enable users to take advantage of the waterside facilities offered, where vessels of up to 21 ft. draft can be discharged or loaded direct to or from the tanks.

The central position of the site in the dock system is of great advantage where oil is to be transferred from deep tanks of ocean going vessels by means of road tank vehicles and for subsequent redistribution inland from store.

The heating system has been designed to ensure that oils can be taken to suitable pumping temperatures efficiently and safely, and in order that actual heating can be kept to the minimum, each tank has been insulated with *Rocksill* to conserve the heat generated from the coils.

The tanks are constructed in mild steel, the plates being welded and a sheer internal surface obtained, thus eliminating the risk of contamination due to oil from previous storage becoming lodged around rivet heads and on girders; each tank is an individual unit with all intake and delivery of oil being carried out by means of flexible pipe lines and mobile electric pumps. This is said, eliminates the most common source of contamination —the permanent pipeline and valve system.

A Tale of Two Cakes

Twenty-one years ago a special cake was baked by the National Bakery School to celebrate the christening of Carol and Lynette, twin daughters of Mr. W. Leonard Hill, the founder of FOOD MANUFACTURE. *History was pleasantly repeated recently when Mr. Perkins of the School made another cake, in similar style, to celebrate the twins' 21st birthday. The photographs on the extreme left (reproduced from "Food Industries Weekly" of 1936) show the original cake and the twins after their christening. The new cake is in the next picture. On the right are (above) the twins cutting their new cake at a garden party and Mr. and Mrs. W. L. Hill entertaining some of the 180 guests at this party. From left to right are Dr. A. J. Amos (chairman of the Food group of the S.C.I.), Mrs. Amos, Mr. E. G. Semler, (editor "Automation Progress"), Mr. G. W. Cooke (Rothamsted Experimental Station), Mr. Hill, Mrs. Hill and Mrs. Cooke.*

Company Profits and Prospects

Bovril profits down

Bovril's net profits fell from £357,977 to £298,596 last year, though the 16% dividend has been maintained.

*

Refrigeration profits doubled

Lightfoot Refrigeration, Ltd., doubled their consolidated trading profit last year according to the chairman, Mr. Kenneth Lightfoot. He reported that trading profit for the year was £72,012 compared with £35,083 a year ago. During the year the company's contracts for armament work ended and they were fully engaged in the manufacture of refrigerating plant, producing 35% (invoiced value) more than in the previous year.

The net profit was £18,986 and a dividend of 6% was paid.

*

Chivers sell can plant

Increased capital profits from the sale of their automatic can-making equipment was a feature of Chivers and Sons' report. Mr. S. O. Chivers, the chairman, said that it is no longer economic to fabricate their own cans for fruits and vegetables.

The seasonal nature of their business of jam and marmalade making, etc., necessitates holding heavy stocks of raw materials and finished goods. Continuing inflation is causing finance to become a major problem for the company, according to Mr. Chivers.

Net profit for the year increased from £82,390 to £86,128. The dividend remained at 10%. Predictions on future profitability, said the chairman, remain uncertain because it is impractical to forsee what the average price of sugar will be.

*

Lyons make more

Expansion in almost all fields of their business was reported by Mr. I. M. Gluckstein at the annual meeting of J. Lyons and Co., Ltd. The first part of the new ice cream factory at Greenford is nearly complete and pilot operations have started. It should be in full production before next year's season. New products introduced by the company during the year included *Ready Brek*, a hot breakfast cereal.

Improvements in production are continuing. For example, the company has for many years taken bulk deliveries of liquid chocolate and liquid sugar by tank wagon into pipe lines. More recently they have been taking dry flour and sugar by pipe line.

The net profit for the year rose by £109,506 over the year before to £871,767. Accordingly an increase of 6d. per unit was paid on the Ordinary final dividends.

OBITER DICTA

● One child's ice cream is another's cold sago pudding. —*Ministry of Education pamphlet on "Standards of Reading."*

● Food habits separate the French from the British more surely than language, the Channel, or the burning of Joan of Arc.—*Taya Zinkin in the Manchester Guardian.*

● In Chicago, Andrew Mulligan, charged with drunken driving, was freed when he explained that police had arrested him just after he had worked eight hours cleaning brewery vats.—*Time.*

● Each night my friend's husband makes 17 sandwiches and takes them to bed to eat during the night. "Isn't it trying," I asked his wife. "Not now," she said. "It used to be biscuits and his munching was just like having a horse in the bed."—*Letter to Woman's Sunday Mirror.*

● It is possible that Homer tasted lemonade, Shakespeare and Voltaire ginger beer, St. Benedict a cordial or two, but these events were unimportant in their lives and the argument that they would have been a lot better had they drunk nothing else is ridiculous.—*"Syllabub" in the Observer.*

● What's the latest novelty in the literary world? Why, the publication, by Pantheon Books in an edition of 512 copies of "Mushrooms, Russia and History," a 2-volume, 93-plate, 30-years-in-the-making, $125 work on "the role played by mushrooms in the daily lives of the varied European peoples."—*New Yorker.*

● "Candyfloss" has always seemed a depraved invention to those for whom the only true seaside sucker was a stick of rock. But what can be said for the latest delight of the small fry on the Isle of Man where, according to reliable reports, the sweet shops are advertising "Manx Kipper Lollies?" — *Manchester Guardian.*

● England is probably the only country in the world where the picnic season brings hours of extra work to the housewife. Italian housewives have different ideas. Their recipe for a picnic is much simpler—a loaf of bread, a pound of veal, a tin of tomatoes, a frying pan and a bottle of wine. —*Press Release.*

News for Importers

Honey.—A quota of £40,000 f.o.b. has been established for the import of honey from dollar sources to June 30, 1958. Details are given in Notice to Importers No. 824.

Olive oil.—The treasury have made the Import Duties (Drawback) (No. 10) Order, 1957, which increases, from 4½d. to 2s. 3d. per gal., the rate of drawback allowable in respect of customs duty paid on certain olive oil used in the manufacture of exported canned fish.

The Order has been published as Statutory Instruments 1957, No. 946.

Canned Salmon.—The Board of Trade announce that further quotas have been arranged for the import of canned salmon from North America and the U.S.S.R. during the year ending June 30, 1958. This is a continuation of the arrangements for imports for the year ending June 30, 1957.

The quotas are as follows from North America: £3·5 million c.i.f. (last year's figure was £3·3 million); and from U.S.S.R.: £1·1 million (the same figure as last year).

Details are given in Notice to Importers No. 822 dated June 21, 1957, issued by the Import Licensing Branch of the Board of Trade.

Apples.—A further quota for the import of fresh apples from N. America for the period ending on June 30th, 1958 has been announced by the Board of Trade. It is to the same value as last year's quota (£1,250,000 f.o.b.). Full details are given in the Notice to Importers No. 823 available from the Import Licensing Branch of the Board of Trade.

Relaxations in Import Licensing Control.—The President of the Board of Trade has announced that import controls are to be removed from a large number of commodities on August 1, 1957.

This mainly affects goods imported from the dollar area.

Existing restrictions will continue to apply to dollar imports of machinery, fuels, many food items, and most manufactured products, including some which are used in industry. There will be a global quota covering all dollar countries of £2 million a year f.o.b. This represents an increase of about £1¼ million.

The revocation of import licensing control on many of the items will be mainly a tidying-up operation which will mean less form-filling for traders. This includes the large number of goods hitherto imported under Open Individual Licences (which do not restrict quantity) or under specific licences which have in practice been freely issued.

This worker at Melbray, Ltd., is operating a new order/delivery system for baked goods which, it is claimed, enables her to do the work of four clerks. Sets of forms—each set consisting of three sheets identically printed except for the heading—are used in the "Cakebread system." The top form in each set is the invoice, the second a copy invoice and the third is the production copy. Carbon paper is interleaved between the sheets. The first and third copies go to the customer and production department respectively. Copy invoices overlap on a summary board, in such a way that the quantity required of any particular item is immediately available. In the top picture the clerk is taking orders. Below, she is cross-checking items on the summary board.

Confectionery sales soaring

Over £255 million was spent on chocolate and sugar confectionery in Britain during 1956; an increase of 4%. Consumption also rose to over 8½ oz. per head, but this was lower than in 1954.

The largest increase was in the sales of chocolate. According to the Cocoa, Chocolate and Confectionery Alliance's annual report, from which these figures are taken, this is attributable to price reductions made possible by lower cocoa bean prices. Exports of chocolate and sugar confectionery last year were a record, reaching £6·5 million and £5·2 million respectively. The quantity involved was also a record, reaching more than 43,000 tons.

Change of address

Roll Race Conveyors, Ltd., have moved to 13-16, Jacob's Well Mews, George Street, London, W.1. Tel: HUNter 0898.

Technical Press Review

AUGUST

Dairy Engineering. — Stainless Steel in the Dairy Industry; The Dairy Industry in Southern Asia—I, India; Cleaning of Dairy Plant and Containers; Of Mice and Milk.

World Crops.—Wild Oats; On Tour with a Logarithmic Sprayer; Lawns and Chemistry; Use of 2, 4, 5-Trichlorophenoxy Acetic Acid in Western Germany; Weed Control; Royal Show Review.

Manufacturing Chemist.—Production and Testing of Anti-Polio Vaccine; The Chemistry and Structure of Insulin II; Glycerin in the Manufacture of Adhesives; Chemistry of Carbon Dioxide; Progress Reports: Disinfectants; Hormones; Antibiotics.

Atomics.—Delft's Nuclear Reactor; Radiochemical Research in the Netherlands; Nuclear Energy Developments in the Netherlands; Atomic Industry and Mechanical Engineering; (Parts 1 and 2); British Automation on Show in Holland; British Protective Glass in Holland.

Petroleum.—The Geology of Australasia; Hydrocarbon Reforming in Relation to Town Gas Supply; Hydrogen Treating in the Refinery; Viscosity-Temperature Relationship; Visit to Coryton; Oil Distribution in the U.K.; Research on Synthesis of Liquid Fuels in China; Canadian Oil and Gas.

Automation Progress. — Design and Use of Hydraulic Servo Systems; Numerical Control of Milling; Data Processing in the U.S. Army; D.S.I.R. Developments; The Inchworm Motor; Automation and the Operator; Data Reduction for Optimum Plant Efficiency; Control Valve Characteristics.

Chemical and Process Engineering.—Infra-Red Absorption as a Process Tool; Principles of Refining Lubricating Oil—2; Let's Look at Engineering; Recent Developments in Crystallisation; Canada's First "Silvichemical" Plant.

Corrosion Technology. — Instruments for Cathodic Protection; Zinc Anodes for Cathodic Protection; Cathodic Protection in Israel on Land and on Sea; U.S. Tankers Freed from Corrosion; Protection of Steel Underground.

For specimen copies write to Stratford House, Eden Street, London, N.W.1.

Infected egg imports

New action designed to prevent the entry into Gt. Britain of infected egg products have been outlined by an official of the Ministry of Health in response to protests by the health committee of the Association of Municipal Corporations.

The letter says arrangements have been made with the medical officers at the ports of entry to sample all imported egg products on arrival and to detain any which are found to contain pathogenic *Salmonellae*. To achieve this end, the importers are working closely with the Ministry.

The letter says the department is in touch with the Commonwealth and Chinese authorities, who have given assurances that they are doing all they can to ensure that their egg products are acceptable to the health authorities in this country.

County Councils' recommendations on food preservatives

The problem of insecticidal residues, particularly on fruits which are wholly used in food products, *e.g.* oranges in the manufacture of "whole orange drinks" or marmalade, was raised by the County Councils' Association in a recent memorandum to the preservatives sub-committee of the Food Standards Committee. The association recommends that the regulations should prescribe permissible maximum amounts of residues on fruits and vegetables.

The association also urged consideration of the use of chemicals in the wholesale packaging of fruit for transport and as to which chemicals, if any, may be used to impregnate food wrappers. They recommended that appropriate provision should be made in regulations on the lines of Regulation 2 of the Public Health (Preservatives etc. in Food) (Amendment) Regulations, 1953, which in effect permits the presence of diphenyl in citrus fruit imported in wrappers treated with diphenyl.

Other recommendations made by the association were that the present method of controlling chemicals in food by a permitted list should be continued, that careful investigations should be made on the use of antibiotics in food and that regulations should make it clear that the inclusion of antimicrobial agents in prepared foods should be indicated on the label.

Compulsory bread wrapping rejected

Following advice received from the Royal Society of Health the joint standing committee of the London borough councils has turned down a proposal that legislation should be sought to provide for the compulsory wrapping of bread.

Food News Overseas

Milk pasteurisation

The Nicaraguan Institute of National Development has signed a loan agreement with the Society of Milk Producers of Leon to assist in the construction of a milk pasteurisation plant which will cost C $4 million.

A further loan has been granted to a U.S. firm to build a refrigerating plant for freezing shrimps and other sea foods.

Burmese sugar refinery

A sugar refining plant has been opened at Namti by the Burmese Minister for Industries. Capable of producing 100 tons of sugar per day from 1,000 tons of cane, the factory was constructed by Japanese engineers and is equipped with Dutch machinery. The factory which is state-owned, cost £1·35 million and when it is in full production it will save the Government foreign exchange to the value of £1·025 million per year.

Mexican coffee plant

A new soluble coffee plant costing 25 million pesos was recently inaugurated just outside Mexico City. The plant "Cafes de Mexico" is being built with Mexican and U.S. capital.

Mexican fruit freezing factory

A freezing plant with a fifty tons per day capacity has been completed in Irapuato, Mexico. Strawberries will be frozen there and exported to the United States.

Coffee "sniffer"

Precisely how long coffee should be roasted is a question which, it is claimed, can be answered by a machine described as a coffee-sniffing device which is being used experimentally by the Southwest Research Institute in the U.S.

As most people are aware, roasting time varies according to the quality and type of bean and the machinery employed to roast it; a tremendous amount depends upon the skill of the operator.

The sniffing device otherwise known as a vapour-phase refractometer has been used to detect the difference between the coffee volatiles, or aroma, providing an analysis in the form of a continuous line in a series of rounded peaks, each peak representing one of some twenty components which determine the coffee aroma.

The point at which the roasting should stop may be determined in the future by comparing the roasted samples with the opinion of expert tasters culminating in the establishment of a standard tape showing the ideal height of a coffee aroma.

Comparisons may be made between different varieties of coffee, different years and a study may be made of the current practice of blending and roasting different coffees.

Antibiotics "on the hoof"

Successful experiments on the injection of the antibiotic oxytetracycline (*Biostat*) into livestock are reported from the U.S.A. The injection makes it possible to extend the period of freshness of the meat after killing, according to speakers at a meeting of the American Institute of Food Technologists. They said that the injection resulted in meat "aged" by high temperature being of improved colour, tenderness and flavour.

Steaks from meat kept for three days at 60-65°F. were better than those from meat chilled immediately after slaughter. Other tests showed that beef carcases kept at temperatures of over 100°F. were also much improved in quality.

It was stated that the new method protected refrigerated meat accidentally exposed to higher temperatures than normal. It also enabled meat to be kept fresh in those parts of the world without proper refrigeration and distribution systems.

Permission to use *Biostat* for preserving poultry was granted in America by the Food and Drug Administration and Department of Agriculture last year. Recently its use for both poultry and fish was made legal in Canada.

Fruit canning in India

The Indian Government has set aside the sum of Rs. 2 million as a loan for setting up 200 small-scale fruit canning centres.

Another Rs. 3·5 million will be put towards the construction of five large-scale plants to be erected in the main fruit and vegetable regions of the country. These loans will be sanctioned as part of the Indian Government's second plan under which fruit preservation is to be extensively developed and they will be made available by the various State Governments.

Slimmer pigs

Immediate adoption of a more selective system of buying hogs on a merit basis to operate throughout the United States has been recommended by the American Meat Institute. The American housewife has shown a decided preference for leaner pork.

Nestle's management institute

The Nestlé Alimentana Co. (Sté An.) of Switzerland has founded the Management Development Institute (I.M.E.D.E.) under the patronage of the University of Lausanne. The Institute will begin courses in September for the administrative and technical staff of Swiss and foreign firms in all branches of commerce and industry.

Korean fish factories

Two fish canneries, a fish meal and oil plant are to be built in Korea by the Standard Steel Corporation of Los Angeles for the U.N. Korean Reconstruction Agency. One cannery and the reduction plant will be at Pohang on the east coast and the other cannery on the island of Nora-do off Korea's south coast.

Du Pont manufactures lysine

L-lysine, an amino acid essential in human nutrition and one in which many cereal foods, notably those based on wheat, are said to be deficient, is now being manufactured by the Du Pont Company of U.S.A. in limited commercial quantities.

The company's Electrochemicals department is now operating pilot plant facilities for producing L-lysine monohydrochloride at its Niagara Falls, New York, plant. This is the naturally occurring form of lysine, which is the only form used by the human body.

The place of amino acids in human nutrition was discussed at the conference on Protein Nutrition held at the New York Academy of Sciences recently.

Du Pont are supporting by means of grants, independent research on lysine-supplemented diets. In addition, the company is continuing a basic research programme on protein nutrition at its own Stine and Haskell laboratories, biological research units near Newark, Delaware.

KRAFT'S NEW AUSTRALIAN FACTORY

This new factory, opened by Kraft Foods, Ltd., at Fisherman's Bend, Melbourne, Australia recently, covers 8½ acres of floor space on a 15-acre site. The Australian business started in 1926 when Kraft Walker Cheese Co. Pty., Ltd., was formed by a young Australian, Fred Walker, who visited the U.S.A. and bought the Australian rights for Kraft processed cheese. In addition to an extensive home market for processed cheese "Vegemite" (a yeast-extract product), beef extract and meat and fish pastes, the company has considerable export business with Asian countries. Above (left) shows the main entrance of the factory, set among lawns and shrubberies and (right) a line of stainless steel cheese blenders. On the right is a line of carton making machines made by the company's own engineering department.

S. African sugar prospects

Confidence in the future of South Africa's sugar industry is indicated by the offer of the Hulett organisation (a large sugar refining company) to purchase the shares of Zululand Sugar Millers and Planters and its acquisition of the Triangle Sugar Estates in Southern Rhodesia.

Our South African correspondent reports that the transaction will increase Hulett's share in South Africa's sugar production to over one-third. One of the great attractions of sugar is today's international price of more than £50 a long ton. As a signatory to the International Sugar Agreement South Africa shares with other Commonwealth producers a quota of 75,000 tons a year. Even if only a fraction of this quantity is sold by South Africa, the profit should be worth while compared with the negotiated price of £42 3s. 4d. paid by Britain for up to 150,000 tons of South African sugar.

The current shipments will continue into September. The full quota is unlikely to be reached this year because of the lower sugar harvest of about 850,000 tons this year. Besides Triangle Estate in Rhodesia, Huletts are interested in a sugar venture in Tanganyika. Should the Government proceed with a proposed railway project from the Transvaal through Swaziland to Natal, a further large area would be opened up for the growing of sugar and the operation of modern sugar mills.

"Beware of clingstone peaches"

South African fruit growers have been warned by the chairman of their Apricot and Peach Growers' Association against heavy plantings of clingstone peaches.

"If the canners should tell us in the future that there is not a good demand for canned peaches and that America has a vast surplus of canned peaches, I will not be able to tell you that canning peaches could be marketed in other forms, as is the case with apricots today," he said. "The clingstone peach tree, however, has a short life and in many soils, especially in wet soils and where water for irrigation is limited, a quality peach cannot be grown."

The chairman urged strict adherence to quality grading standards by canners, and also warned canners against conditional selling in overseas markets. The strong demand for peaches (see FOOD MANUFACTURE, April, p. 140) was used to help sell less popular lines, the chairman alleged. He thought that each variety should be sold on its own merits. The association had decided to meet the Minister of Agriculture to discuss proposals for control under the Marketing Act.

Spanish-American oil agreement

Mr. Howard L. Roach, president of the United States Soya Bean Council has visited Spain and spoken of an argeement whereby the U.S. would import two litres of olive oil from Spain in exchange for every litre of American soya bean oil, payment being made in the currency of the purchasing country. Mr. Roach said that between April 1955 and May 1957 Spain had imported 335,000 tons of American vegetable oils (281,000 tons of soya bean oil and 54,000 tons of cottonseed and peanut oils), 300,000 tons of which had been supplied under the U.S. surplus agricultural exports agreement and the remainder by private enterprise.

Packaging

Steel strapping tool

The range of tensional strapping tools made by A. Power and Sons (Box Strappings), Ltd., has been extended to include ½ in × ·012 in. steel strapping. This, they say, has hitherto been a neglected size and in view of its potentialities covering the range of smaller packages where contents of a soft nature might be damaged by wire strapping, the ½ in. size will be very acceptable to many trades. A joint of great strength is formed being fastened with a coloured seal giving an attractive appearance.

One-trip beer bottle

Glass bottle manufacturers are offering a non-returnable bottle to brewers. Designed to hold a half-pint of beer, the bottle is shaped attractively and it is stated to be easy to handle and almost half as light as the bottles of similar capacity at present in use.

For many years the proportion of bottled to draught beer has been increasing and recently it has become apparent that for the casual trade, where the collection of empties is difficult or impossible, there is a need for a non-returnable bottle. The Glass Container Research Committee has designed the bottle which, although much lighter than the existing multi-trip bottle, is claimed to be sufficiently robust to withstand sterilising, high-speed filling, crowning and distribution to the customer who, in turn, will have no need to return the empty.

One of 14 new packs for quick-frozen fish.

Smaller steel strapping can be used with the new tensional strapping tool manufactured by A. Power and Sons (Box Strapping) Ltd.

Quick-frozen fish packs

A range of 14 quick-frozen fish packs have been designed, printed and manufactured by Transparent Paper, Ltd., for Mudd's of Grimsby.

The packs, all with the same design theme, are clean and fresh in appearance. The predominating white provides an excellent background for the black and red lettering as well as for the product name "flash" with its reverse lettering, and for the gold horizontal lines fringing the pack. The glossy finish results from the print being "sandwiched" between the two plies of *Diophane* cellulose film used in the formation of the *Diolam*.

The design is adaptable to cover a wide range of fish, the only change required for each pack being in the lettering of the product name "flash" and the end seals. This method of presentation ensures continuity of brand presentation and stimulates pack recognition.

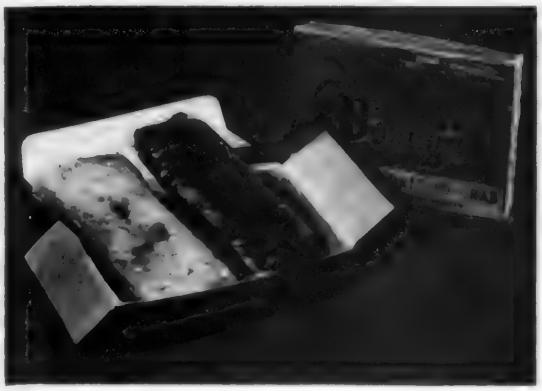
Bowater-Eburite Sales Ltd. held an exhibition of fibreboard for packaging in Manchester recently. Seen here are Mr. N. R. Worthington, and Mr. J. L. Rudd, both of Andrew Ritchie and Son, Ltd., discussing containers for food products. The containers cover the whole gamut of food packaging, including canned goods, sauces, etc.

Containers for the export market

John Walker and Co., Greenock, sugar refiners and syrup manufacturers, have entered the export markets for the first time with three new packages. These are special *Skey* cans for syrup and treacle, and tubes for picnic syrups. The *Skey* cans open with a key and the lids are hinged so that they cannot be lost and can be replaced easily and snugly.

These cans have been developed both for the firm's syrup and treacle and molasses products and enquiries are being received for them from firms at home and overseas.

Syrup in a tube is stated to be a logical development of the firm's activities to meet the demand for a compact, easy to handle container, suitable for picnics, camping and weekend trips, etc. The tube is unbreakable and prevents waste.



White and dark crab meat in transparent film. A new quick-chilled pack marketed by Young's Potted Shrimps Ltd.

Self-adhesive tape

Outstanding features of their new self-adhesive tape, according to John Gosheron state, are great tensile strength and flexibility which allows continuous adhesion to a surface. It is claimed that when applied to a carton the vinyl backing protects the reinforcing fibres from abrasion. The tape may be used for both reinforcing and banding.

"Flavour bud" jellies

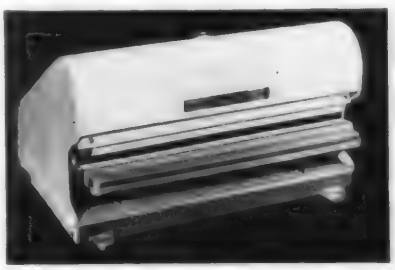
G. Havinden, Ltd., have just begun to market *Lushus Flavour Bud* jellies in a new pack. The cartons are illustrated with fruits in colour on front and end panels and have been designed for easy selection and self-service display. A white plastic counter dispenser, as illustrated, is being supplied.

The *Flavour Bud* is a hard sugar case containing liquid flavour. A rich and full flavour is produced by this means. Three entirely new flavours are offered: grape, black cherry and black raspberry.

Frozen crab meat

Pre-packaged quick-frozen crabmeat, is a new addition to the range of quick-chilled fish marketed by Young's Potted Shrimps, Ltd. This means that top-quality crabmeat, prepared from crabs caught in the June-December season when the shellfish are fully mature, is now available all the year round. An hygienic, wax-impregnated bleached sulphite carton is used, containing two transparent bags of crabmeat, one of white meat and one of dark. This is overwrapped with the special type of *Cellophane* developed to withstand quick-freezing conditions. The same kind of cellulose film is used for the bags, which are manufactured by Colodense, Ltd. The transparent overwrap provides additional protection and allows the carton design, printed in light blue, orange and white to make its full impact. The carton is made by Pearlite Box Co., Ltd.

New counter dispenser for Havinden's jellies.



Hand-operated sealer for bags of polythene and other heat sealing films.

Polythene sealer

A new heat sealing machine for polythene bags is now available from the Hypak division of the Oppenheimer Casing Co. (U.K.), Ltd. Known as the *Hypak Polysealer*, it requires only one operation for the complete sealing cycle.

The machine being single action, leaves both hands of the operator free to control the bag or tubing being sealed. There are no treadles or hand levers—the complete sealing operation is performed by using the knuckles of the hands controlling the article to be sealed. It is claimed that up to 500 bags per hr. can be sealed. The machine is adaptable for wall-mounting for the sealing of bags containing liquids or other free flowing materials.

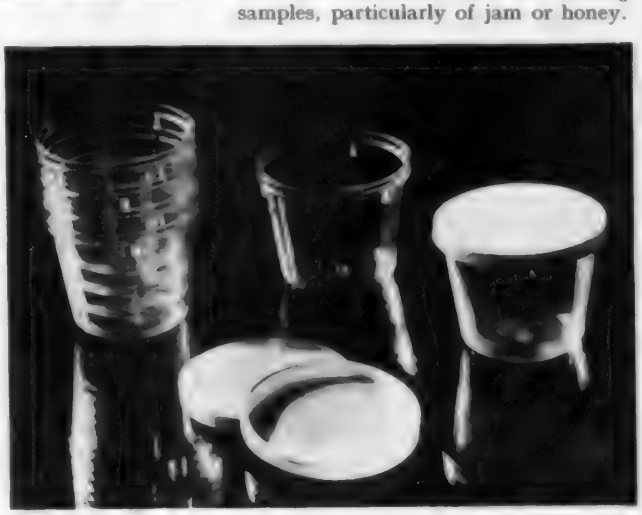
The makers claim that every type of material which requires heat sealing, including MSAT cellulose film, *Pliofilm* and polythene to A.I.D. and A.R.B. specifications can be sealed.

The *Polysealer* gives an instantaneous coalesced seal on gauges up to 500 and a rapid coalesced seal on gauges 150/500, sealing bags up to 13 in. wide and tubing upt to 11 in. wide. The machine measures 17 in. × 9¼ in. × 8¼ in. and costs £19 19s.

Polystyrene jars

The Metal Box Co. is now producing small transparent polystyrene 1 oz. jars. They say the jars are much lighter than glass and do not break easily; nor do they splinter. They have a crystal clear appearance, and are made to nest. Three small nibs immediately under the neck ring prevent the jars from sticking together when stacked inside each other. They can be sealed with a polythene snap-on cap, which may be printed, if required, in one colour.

The jars are considered to be the right size for miniatures and for holding samples, particularly of jam or honey.



Unbreakable and transparent, the new polystyrene jars produced by The Metal Box Company are specially designed for miniature 1 oz. packs.

New Companies

Allans Crumpets, Ltd. (585592.) 10, Norwich Street, Leeds, 10. Mfrs. of and dlrs. in crumpets, muffins, bread, biscuits, cakes, etc. £2,000 Dirs.: W. A. and G. H. Petch.

Bel Ami Wine Co., Ltd. (585945.) £100. Subs.: J. R. S. Hadfield and M. W. Woodthorpe, 18, Austin Friars, London, E.C.2.

British Bacon Curers' Federation. (585408.) Word "Ltd." omitted from title by licence of the Board of Trade. To become a corporate non-profit-making body representing the interests of the bacon curing industry in the U.K. Council: Sir John Bodinnar, H. Martin Lewis, C. W. Bird, R. E. Blanning, R. Deans, J. F. Evans, J. Frew, E. Gunner, T. Hollingsworth, F. D. Lawson, D. McGroutner, E. E. Marsh, E. Shephard, H. J. Spackman, H. M. Steel and F. T. S. Williams.

Florida Citrus Co. (England), Ltd. (586550.) Phœnix House, 19-23, Oxford Street, London, W.1. £100. Subs.: R. R. Saunders and Mrs. R. Baron.

Hammetts Foods (Exeter), Ltd. (586481.) Midland Bank Chambers, High Street, Exeter. £5,000. Dirs.: C. S. and Mrs. A. E. Hammett, S. J. Hammett.

James Linde, Ltd. (586600.) 64, West Smithfield, London, E.C.1. Salesmen, brokers, merchants, importers and exporters of frozen and fresh meat, etc. £10,000. Dirs.: N. and J. Van der Linde.

Manchester Pre-Packing Co., Ltd. (585641.) Aldred's Buildings, Smithfield Market, Manchester, 4. Pre-packers of foodstuffs, etc. £100. Subs.: H. Butterworth, M. Bithell.

Oldacre's Bakeries, Ltd. (586078.) £100. Subs.: E. G. Maliphant, 1, The Cedars, 289, Prestbury Road, Prestbury, Cheltenham, Miss J. M. Price.

Parsons Dairies, Ltd. (585858.) Mill Street, Wincanton, Somerset. To take over business of dairymen and mfrs. of ice cream carried on at Wincanton by Harold G. and Fredk. J. Parsons. £1,000. Dirs.: H. G. and F. J. Parsons, L. Tucker.

Poultry Administration, Ltd. (585810.) Briset House, Briset Street, London, E.C.1. Council: R. G. C. Watson, R. C. Tambling, A. G. A. Fisher, J. L. E. Ogier and T. A. Smith.

P.P.T. Foods, Ltd. (584048.) 71, The Close, Norwich. £250. Subs.: J. M. Place and M. E. Peach.

Standard Yeast Co., Ltd. (585966.) £100. Subs.: L. Maggs, 34, Palace Court, Bayswater, London, W.; H. W. Clements, Uplands, Monkton Coombe, nr. Bath.

Vettese (Gt. Yarmouth), Ltd. (585561.) 66-68, Regent Road, Gt. Yarmouth. Mfrs. of and dlrs. in ice cream, cream, milk, etc. £5,000. Dirs.: J. Vettese, Onarina Wills, V. Pumfrey.

Warburton's Bakeries (Wath-on-Dearne), Ltd. (586,570.) 2, Melton High Street, Wath-on-Dearne, Yorks. £10,000. Dirs.: F. E. and Mrs. E. M. Warburton, Mrs. F. M. Bailey and J. D. Bailey.

Watkin and Sons (Grantham), Ltd. (579918.) John Baldock and Gregory, Midland Bank Chambers, Westgate, Grantham, Lincs. Pork pie specialists. £1,000. Dirs.: P. and Beryl F. Watkin.

West End Meat Supply Co., Ltd. (586495.) 52, Kingsley Mansions, Queens Club Gardens, London, W.14. £100. Dirs.: J. K. Hunwick, H. Porter.

West Ham Abattoirs, Ltd. (579993.) 6, Broad Street Place, London, E.C.2. £500. Subs.: P. L. Denman and L. Major.

Wine and Spirits Patents, Ltd. (579997.) 3, Cork Street, London, W.1. To acquire letters patent relating to any invention concerned with the mnfr., brewing, distilling, bottling, compounding, reducing, blending and storing of beer, stout, spirits and wines, etc. £100. Dirs.: P. L. Waddell, J. K. Malcolmson and A. W. Campbell.

These particulars of new companies recently registered have been extracted from the daily register of Jordan and Sons, Ltd., Company Registration Agents, 116, Chancery Lane, London, W.C.2.

New Scottish Companies

Duncan and McFadyen, Ltd. (31974.) 74, Melbourne Street, Glasgow. Sausage casing makers, spice merchants, etc. £500. Dirs.: M. Duncan and T. McFadyen.

Samuel M. Dunn, Ltd. (32059.) Mfrs. of and dealers in foodstuffs, produce and provisions, etc. £3,000. Dirs.: S. M. and Jane C. Dunn, 50, Glasgow Road, Baillieston, Glasgow.

Frozen Foods (Inverness), Ltd. (32060.) 13, Lombard Street, Inverness. To acquire from The Highland Fish Co., of 28, Union Street, Inverness, the goodwill and assets of that portion of their bus. consisting of the wholesale distribution of frozen foods, etc. £1,000. Dirs.: Wm. M. Ferguson and George Barrie.

Glencraig Bakeries, Ltd. (32094.) Mfrs. of and dealers in bread, cakes, biscuits and other bakery goods. £100. Dirs.: R. P. F. McClelland, The Stores, Trabboch, Mauchline, Ayrshire, and A. K. Gourlay.

Glenstruan Fishing Co., Ltd. (31950.) 186, Market Street, Aberdeen. Fishermen. £12,500. Dirs.: John W. Johnstone and H. S. Robertson.

T. P. K. Hannah, Ltd. (31976.) Underwood Road, Paisley. Mfrs., merchants and distributors of confectionery goods, etc. £25,000. Dirs.: G. K. Horner, A. B. Williamson and T. P. K. Hannah.

Kelard, Ltd. (32142.) Brewers, distillers, etc. £5,000. Subs.: J. M. Brown and Myra Dalton, 166, Buchanan Street, Glasgow.

MacDonald, MacLean and Co., Ltd. (32148.) 21, West Nile Street, Glasgow. Brewers, distillers, etc. £3,000. Dirs.: Ewen MacDonald and W. G. MacLean.

George Mason (Johnstone), Ltd. 107, Douglas Street, Glasgow. Brewers, distillers, etc. £100. Dirs.: James Taylor, Thomas T. Roach and J. P. Dunlop.

Walter Montgomery and Co., Ltd. 259, Alderman Road, Knightswood, Glasgow. Confectioners, fruiterers, etc. £4,000. Dirs.: Andrew and Walter Montgomery.

The Roseburn Bonding Co., Ltd. (31989.) Brewers, distillers, blenders, bottlers, etc. £20,000. Subs.: Andrew Lothian and James B. Highgate, 241, St. Vincent Street, Glasgow.

Sistacream (Confections), Ltd. (32010.) Mfrs. of and dealers in confections, etc. £100. Dirs.: W. B. Haddow, Clunatine, Moncrieff Avenue, Lenzie, J. M. Rae, T. A. Wilson and James Harvey.

Trade Marks

DIET - SWEET (design). — 759,019. Canned, preserved, dried and frozen fruits and vegetables; jams and marmalade; jellies for food; and salad dressings and salad oil. **Pratt-Low Preserving Co.,** Corner of Franklin and Bellomy Streets, Santa Clara, California, U.S.A.

SEA-CHIEF.—760,639. Fish (other than live fish) and fish products (for food). **J. Jangaard, Ltd.,** 25, Monument Street, London, E.C.3.

MAID OF THE DALES.—760,237. Condensed milk, dried milk, evaporated milk and dairy products (for food). **Cow and Gate, Ltd.,** North Street, Guildford, Surrey.

LADYDAY. — 763,182. Meats, fish, fruits and vegetables, all being canned goods. **Antonio Gonzales, Ltd.,** Moorgate Hall, Moorgate, London, E.C.2.

SPILLERS HI-LITE.—750,024. **Spillers, Ltd.,** 40, St. Mary Axe, London, E.C.3.

DUJAS.—755,523. Chocolate, cocoa and non-medicated confectionery. **Suchard Holding S.A.,** Place St. François 14b, Lausanne, Switzerland

PABLO.—B757,025. Bubble gum being chewing gum. **Madison Food Products, Ltd.,** 52, Gloucester Place, London, W.1.

KEMP'S JAMBLES.—758,825. Biscuits (other than for animals) for sale in Great Britain. **Scribbans-Kemp (Bakeries), Ltd.,** 1000, North Circular Road, Cricklewood, London, N.W.2.

TANGO.—760,050. Chocolate couverture. **The Nestlé Co., Ltd.,** Hayes, Middlesex.

TRU-SIL LOCKED-IN.—760,338. Flavourings (other than essential oils). **W. J. Bush and Co., Ltd.,** Ash Grove, Hackney, London, E.8.

MORELTO.—762,111. All goods in Class 30. **Pascall-Knight, Ltd.,** 130, Oval Road, Croydon, Surrey.

ANGLIAN ROSE.—762,217. Confectionery (non-medicated). **Oriental Confectionery Manufacturers, Ltd.,** St. Germain Street, Huntingdon.

ERINVALE.—B760,210. Canned fruit. **Lindsay Tolland,** 36 Victoria Square, Belfast, Northern Ireland.

BINGO.—761,410. Non-alcoholic milk beverages. **Cow and Gate, Ltd.,** North Street, Guildford, Surrey

COTTAGE BRAND. — 762,459. Condensed milk and tinned cream (for food). **The Anglo-Saxon Condensed Milk Co., Ltd.,** 28, Monument Street, London, E.C.3.

FOUR SEASONS.—762,657. Dried herbs for food. **Quittendens, Ltd.,** Hawkhurst, Kent.

LYONSMAID. — 760,424. Chocolate, sugar confectionery, custard powder, Christmas puddings, pies, cakes, flour confectionery, bread, bread rolls, tea, coffee, mixtures of coffee and chicory, and ice cream. **J. Lyons and Co., Ltd.,** Cadby Hall, London, W.14.

PEP-SELS.—760,612. Biscuits (other than biscuits for animals). **Koninklijke Verkade Fabrieken, N.V.,** Westzijde 103, Zaandam, Holland.

ARROWMINT.—761,127. Mint-flavoured chewing gum. **Wrigley Products, Ltd.,** East Lane, North Wembley, Middlesex.

New trade marks are from the Trade Marks Journal. Permission to publish has been given by the Controller of Her Majesty's Stationery Office. Copies of the publication are obtainable from the Patents Office, 25, Southampton Buildings, London, W.C.2.

Information and Advice

This Service is available to subscribers to FOOD MANUFACTURE. If a stamped addressed envelope is enclosed replies will be sent by post. Enquiries cannot be answered by telephone.

Anchovy paste

B.8240. *Can you suggest a recipe for anchovy paste?* (London, E.C.3)

We suggest you try the following recipe as a basis for experiment:

Anchovies	112	lb.
Butter	18	lb.
Salt	2½	lb.
White pepper	4	oz.
Curry powder	1	oz.
Ground nutmeg	½	oz.
Colour to suit		

Split, bone and mix the fish with the other ingredients. Pass the mixture through a fine mincing machine and a fine sieve, then fill into containers and process for about 45 min.

Dill pickles

B.8245. *Please give me a recipe for sweetened dill pickles.* (Madrid, Spain)

The following recipe for a sliced sweet dill pickle may be used as a basis for trial.

White distilled vinegar (100 grain)	10	gal.
Mixed spices	1	lb.
Allspice	3	
Clove	½	
Celery seed	1	
Dill emulsion 10% oil	2	oz.
Sugar	80	lb.

This should be enough for one barrel of finished pickles.

Here is a recipe for the 10% dill emulsion:

Dill oil	1	qt.
Powdered gum arabic	5	oz.
Powdered gum tragacanth	5	oz.
Water to make	2½	gal.

Pour the oil into the mixing bowl and add the gums. Then mix to prevent lumping and break apart as it permits each article to be coated with oil and makes a more stable emulsion. Stir at medium speed and add slowly gallon of hot water, following with the balance of the water, which may be either hot or cold. The use of about one or two ounces gives the desired flavour for each 200 gal. of brine.

Canned oxtail soup

B.8324. *Can you give us the canning procedure for oxtail soup?* (Fremantle, Australia)

According to *Campbell's Book on Canning*, the stock used in this soup is made by cooking 1,000 lb. of oxtails in 200 gal. of water.

Use 50 gal. of the soup stock, 2½ oz. of ground cloves, 5 oz. of ground coriander seed, 1 oz. of ground fennel seed, 2½ oz. of ground bay leaves, 1 oz. celery seed, 20 oz. of granulated sugar, 1 oz. of white pepper, 2 oz. of butter, and 6 lb. of wheat flour. Melt the butter, add the flour and sugar and cook until brown. Then make a thin paste by adding 1 gal. of warm—not hot—water to the mixture, then adding to the paste the soup stock with the spice and 3 lb. of salt, and cook all together until the soup begins to thicken. Fill into No. 1 cans. Exhaust 3 min., process 30 min. at 250°F. Dilute one-half when serving. Various vegetables are often added. To make a concentrated soup, double the ingredients and add 1 lb. of beef extract for each 50 gal. of stock.

Puffed cereals

B.8421. *Can you give us any information on the manufacture of "puffed" breakfast cereal?* (Dublin)

Rice grains are enclosed in a pressure chamber, or "puffing gun," and heated. This gradually increases the aqueous vapour pressure until the gun is opened. The pressure is suddenly released and the expansion of the water vapour and other gases results in the rice grains "exploding" to several times their original size. "Puffing guns" are commercially available (suppliers given).

Information supplied

The Enquiry Service has dealt with requests for names of manufacturers and suppliers of plant, machinery and materials, and also general information as follows:

B.8141. *Suppliers of 50 gal. pressure cooker.* (Liverpool)

B.8142. *Formula for canned dogs' meat and cats' meat.* (Trowbridge, Wilts.)

B.8143. *Prevention of stickiness in boiled sugar products.* (Clevelleys, Lancs.)

B.8144. *Fishcake making machinery.* (Aberdeen)

B.8145. *Advice on making coffee extract.* (Sunderland)

B.8146. *Manufacturers of sausage making machinery.* (Belfast)

B.8147. *Formulae for toffee, cream biscuits and marzipan.* (Dublin)

B.8148. *Makers of milk powders.* (Khartoum, Sudan)

B.8149. *Makers of plant for concentrating tomato pulp.* (Melbourne, Australia)

B.8150. *Advice on dehydration of tomatoes and citrus fruits.* (Khartoum, Sudan)

B.8151. *Suppliers of cream whipping machine.* (Ruislip, Mdx.)

B.8153. *Differentiation between cooked meats.* (Co. Mayo, Eire)

B.8155. *Recipe for salad dressing.* (Hamburg, Germany)

B.8156. *Recipe for chocolate manufacture.* (Bombay, India)

B.8157. *Makers of lemon-peeling machine.* (London, N.7)

Recent Patents

COMPLETE SPECIFICATIONS ACCEPTED

780,996. M. Egi, P. Fiorenzato and I. Novi: Machine for preparing coffee.
781,062. Guardite Corporation: Quick-cooking cereal.
781,213. A. Benedettelli: Automatic machine for forming extruded products from pasty materials.
779,527. T. T. Vicars, Ltd., and J. F. Naylor: Baking dough products.
779,560. Allen Chlorophyll Co., Ltd.: Canning green vegetables.
779,576. R. P. C. Carcassonne-Leduc: Method and device for cooking and drying rice.
779,768. Hunt Partners, Ltd.: Containers for fruit and other articles.
779,777. Baker Perkins, Ltd.: Stripping apparatus for bakery oven and like conveyors.
779,830. Wolff and Co. Komm.-Ges Auf Akt.: Method of producing synthetic sausage casings.
779,831. H. Schroder: Dough dividing and kneading machines.
780,097. G. Calil and M. Guernier: Edible food products from peanuts.
780,128. Doughnut Corporation of America: Tray loading apparatus.
780,385. M. C. D. Niemantsverdriet and P. G. Endeveld: Machine for making confectionery.
780,333. A. T. Friis-Andersen: Composition of matter for use in the production of goods from flour and/or sugar.
780,411. Chocoladefabriken Lindt and Sprungli Akt. Ges.: Wrapping means for tablet goods.
780,597. J. W. and J. K. Thompson: Apparatus for grading tablets, sweets or like pieces according to thickness.
780,606. Kraft Foods Co.: Cheese-making apparatus.
780,617. Freudenberg Komm.-Ges. Auf Aktien.: Synthetic edible sausage casings.
780,800. Baker Perkins, Ltd.: Oven conveyors.

ABSTRACTS OF BRITISH PATENTS

Tea extract

In a process for making an instantly soluble tea extract, the leaf, having been harvested from the bushes, has its moisture content reduced by evaporation, which may be assisted by forced air circulation, etc. It is then disintegrated or perforated so that the leaf structure is thoroughly ruptured, exposing the juices in the leaf cells for fermentation and extraction. The perforation may be carried out by such means as squeeze rolls, a hammer mill, a pulveriser or shot blasting. The treated leaf is then exposed to air or to oxygen and allowed to ferment with or without the assistance of such means as barrelling. When the desired degree of fermentation has been reached it is arrested by heating the leaf matter, by drying under vacuum or by at once leaching out the soluble constituents with hot water, steam or other solvent. If the fermentation is arrested by drying the dried material can be stored and the leaching carried out at a later date.

A hot air blast may be used to dry out and arrest fermentation in the leaf.

Extraction may be assisted by pressing the leaf after washing, or may be effected solely by pressing.

The liquor obtained may be concentrated by vacuum to a concentrated liquor or to a powder.—776,565. *P. W. Thornhill.*

Tea-leaf drying plant

An aim of the present invention is to provide an improved plant for handling tea-leaves without breaking or bruising them. A process and plant for handling tea-leaves, which may be economically installed and occupies a comparatively small floor area, consists in the method of vertically displacing leaf material in layer form under gravity action from one superposed air-pervious grid staging within a chamber wall to another by the successive retraction of the grid stagings horizontally from the chamber. This causes the deposition of the layer as a whole upon the next staging.

The plant has a series of vertically spaced horizontal grid stagings supported in a tier. These are mounted for manual or automatic reciprocation adapted to effect their withdrawal horizontally out of the tier and their restoration to the tier. This is done in succession so that each layer spread upon the uppermost grid is caused to descend from grid to grid subjecting each layer to uniform treatment by vertical hot air currents. The preferred velocity of the withdrawal movements is such that each layer is deposited as a whole on the tray below without disturbing the leaf very much. The leaf continuously descends stage by stage, but the sequence of grid movement is in ascending succession, the lowermost grid being withdrawn first, followed by the next immediately above.

Also included in the claim is a means for discharging the leaf periodically immediately before the lowermost grid is withdrawn and which otherwise remains withdrawn.—761,977. *Brooke Bond and Co., Ltd.*

Composite food making machine

A machine for producing a food product with an edible centre and an edible coating comprises in combination a hopper for the edible coating and a nozzle attached to the lower portion of the hopper. The nozzle consists of a pair of concentric tubes with a plunger reciprocably mounted in the inner tube to force the edible centres out. The discharge end of the inner tube terminates within the outer tube, and a feeder mechanism is attached to the hopper for feeding the edible coating between the inner and outer tubes, so that the edible coating is forced on to the edible centres as they are ejected from the inner tube by the plunger.—776,630. *D. Newland.*

Bag filling machine

One of the difficulties when filling plastic bags with sweets, etc., is that in opening the bags before delivery of the sweets, the sides of the bags tend to stick together even though the tops of the bags are separated.

According to the invention apparatus is provided to overcome this difficulty. A bag is inserted between a pair of jaws which have aligned recesses on their engaging faces. A first passage in each jaw communicates with each recess at a point below the top edge of the bag when it is positioned between the jaws. A second passage in one of the jaws communicates with the recess at a point above the top edge of the bag. Means are provided for closing the jaws, for applying suction to the first passages and applying pressure to the second passage. The closing of the jaws and the application of suction and pressure take place in timed relationship to the insertion of the bag between the jaws so that the sides of the bag are drawn into the recesses providing a passage into the bag. This enables the applied pressure to at least partially inflate the bag.—777,029. *R. W. Barraclough, Ltd.*

Transfer gear for bakers' ovens

This invention is for apparatus to synchronise the operation of intermittently energised, constant speed, transfer gear with the travel of trays carried by a variable speed conveyor in a baking oven. The speed of travel is varied according to the "bake" time desired for a particular product. Consequently the actuation of the constant speed transfer gear which operates to load the baking tins from or on to the fixed platform at the mouth of the oven must be correlated with the travel of the trays of the conveyor.

Where there is a timing wheel run off the oven conveyor to actuate a control switch which energises a loader, such a system has various disadvantages since, if the oven is run too fast, the loader does not vary its speed of operation and jamming may occur between the tray and the fixed platform. If the oven speed is too slow then the tins will have a drop to the tray platforms.

The object of this invention is to reduce these risks by providing an apparatus for synchronising the operation of the intermittent transfer gear for the loader wherein the transfer gear operates at a constant speed. This comprises electrically operated actuator means for the transfer gear which has a control switch and a device for operating the control switch in accordance with the conveyor speed whereby the transfer gear operates at all times in synchronism with the conveyor.—776,740. *Baker Perkins, Ltd.*

Abstracted from the Official Journal of Patents and from published specifications. These publications are available from the Patents Office, 25, Southampton Buildings, London, W.C.2.

Why shouldn't Daphne move with the times?

Do you want to lag behind? You wouldn't say so—but that's what you're doing if you don't use Golden Glow for your bulk milk needs. Golden Glow is just like milk—but it's easier to store, easier to handle and keeps much longer. And for bulk users it's certainly much more economical.

FULL CREAM MILK POWDER Spray and Roller process	56-lb polythene-lined cartons 28-lb lever lid tins
SEPARATED MILK POWDER Spray and Roller process	28-lb tins, lever lid 28-lb and 56-lb waxed bags polythene-lined

GOLDEN GLOW for all your needs

ENGLISH MADE

GOLDEN GLOW LTD · CENTRAL BUILDINGS · GUILDFORD · Tel.: GUILDFORD 2346

WILLIAM BRYAN LTD

For Finest Quality

PEPPER & SPICES

MACE, NUTMEGS, GINGER, CINNAMON, ETC.

HERBS **KIBBLED ONIONS**

VEGETABLE EXTRACT **ONION POWDER**

Send your enquiries to:

3 LOVAT LANE
EASTCHEAP, LONDON, E.C.3

TELEPHONE NO.: MAN 1457. TELEGRAPHIC ADDRESS: VOLTZINE, BILGATE, LONDON

LEONARD HILL [BOOKS] LIMITED

This is the only book dealing exclusively and fully with table and baking margarines, cooking fats, shortenings, and vanaspati ghee. It traces their histories in Europe and North America, and India; describes extraction, refining and hydrogenation of fats used, accompanied by up to date world statistics, and deals in great detail with every aspect of their production. The critical appraisal of the modern machinery will be most appreciated by those planning a new factory.

MARGARINE

And Other Food Fats

M. K. Schwitzer, M.I.Chem.E.

Price 46s. net
Demy 8vo.
vi + 400
Illustrated

If you have found Mr. Schwitzer's book *Continuous Processing of Fats* useful, then this book will become your indispensable companion. There are some 1,000 references, 42 illustrations and 25 tables.

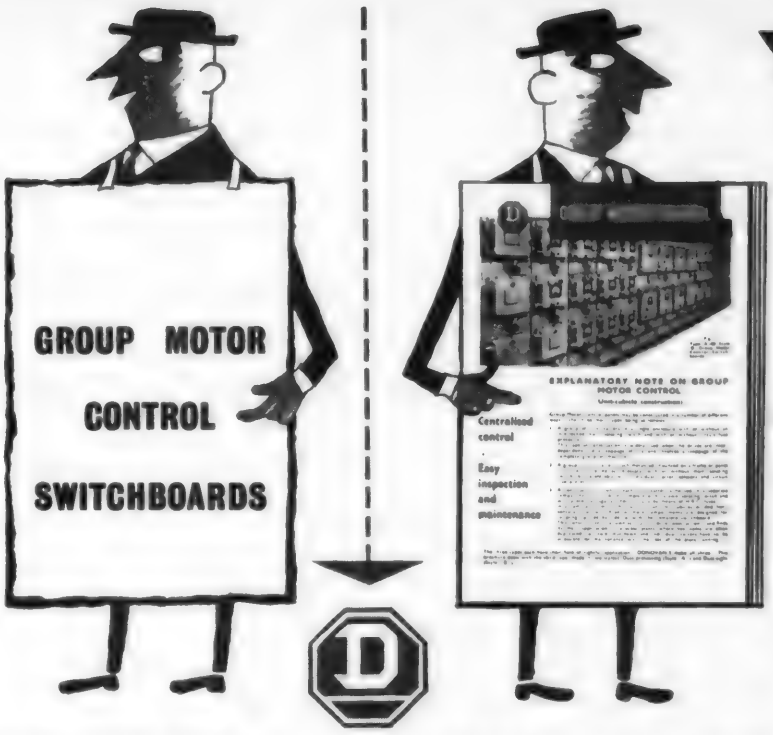
Contents: Food Fats. Margarine and Cooking Fats: Their History and World Trade. Fats used in Margarine and Cooking Fats. Processing Fats for Margarine and Cooking Fats. Theoretical Aspects. Margarine Manufacture. The Manufacture of Cooking Fats and Related Products. Wrapping, Packing, and Preserving. Industrial Uses of Margarine and Cooking Fats. Dietary and Legal Aspects. Subject Index.

9 Eden Street, London, N.W.1 · *Obtainable from your bookseller.*

read any good *brochures* on

GROUP MOTOR CONTROL SWITCHBOARDS

lately ?



Yes- I wrote for a copy to DONOVANS

If you are interested in the centralised control of groups of motors in Chemical Plants, Gas Works, Boiler Houses, Material Handling Installations, or anywhere in fact; you will find the new Donovan brochure invaluable.—Why not send for a copy today?

THE DONOVAN ELECTRICAL CO. LTD

73, GRANVILLE STREET, BIRMINGHAM 1.

Matched to your requirements

For screening, sorting or sifting heavy minerals or fine powders.

For filtering and processing liquids and semi-solids.

For restricting access and providing protection.

For improving presentation, the ornamental patterns add style and dignity to industrial design.

Please ask for Catalogue No. FD 858.

'Harco' Woven Wire

Harvey

G. A. HARVEY & CO. (LONDON) LTD.
WOOLWICH ROAD, LONDON, S.E.7
Telephone : GREenwich 3232 (22 lines)

T. M. Duché

& Sons (U.K.) Limited

Established in 1857

100 YEARS OF QUALITY & SERVICE 1857 - 1957

Gelatines

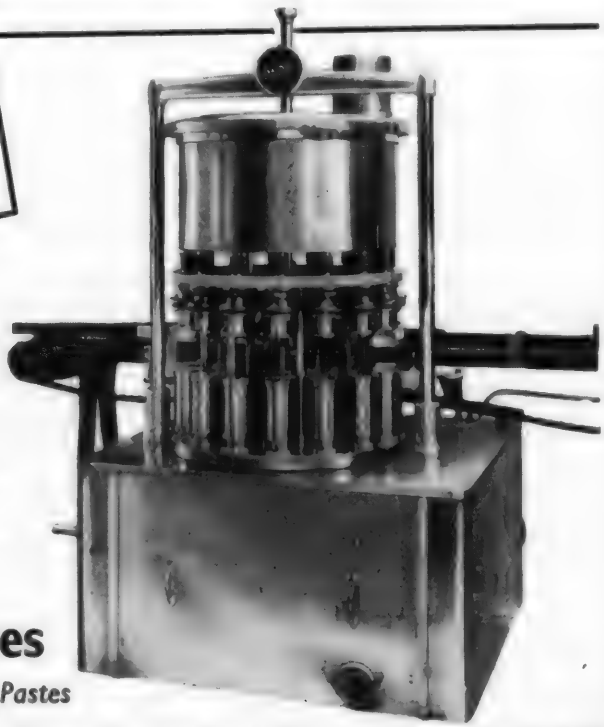
'Protan' Alginates
Almonds, Hazelnuts &c.
Cocoa Butter
Agar-Agar
Gum Arabic
Glacé Cherries
Desiccated Coconut
Egg Products

"Genu" Pectin

ADELAIDE HOUSE, LONDON EC4 Tel: MANSION HOUSE 7681 Also at GLASGOW & MANCHESTER

See ALBRO for Fillers & Cappers

A new 15-head fully-automatic filler for powders



This Albro 15-head fully-automatic, vacuum-operated rotary Powder Filler (the first of its kind) is capable of an output of 120 containers a minute.

It is *completely dust-proof*, and designed to eliminate small parts which may be lost or damaged. There are no moving parts in contact with the product.

There is an Albro machine to fill every need. Write for full details of the complete range of fillers and cappers.

ALBRO Filling Machines

for Liquids, Powders and Pastes

ALBRO FILLERS & ENGINEERING CO. LTD., Wharf Rd., Ponders End, Middx. *Telephone:* Howard 2622. *Telegrams:* Albromach, Enfield

the ETHICAL approach to 'PESTILIMINATION'

If you only want to be able to say
'it's been treated' you don't want us.
But if you want to have the job
done properly, here is a firm with the
highest degree of knowledge,
based on twenty-five years international
experience—who won't take
on a job unless they know they can
achieve results

—it's SAFER to say

LONDON FUMIGATION

and make sure of satisfaction

★ **WAREHOUSES · SHIPS · FACTORIES · STORED PRODUCTS**

If you have insect pests in any of these, it will pay you to get in touch with us. Write or telephone our nearest branch office—now.

The LONDON FUMIGATION CO. LTD
Experts in all methods of insect pest control.

LONDON	MANCHESTER	BRISTOL
Marlow House,	29 Minshull St.,	181 Easton Road,
Lloyd's Avenue	Manchester 1	Bristol 5
London E.C.3	CENtral 0842	Tel. 58521
ROYal 7077/9		

Mitchell

FLUID MIXING SPECIALISATION

- *Illustrations show batteries of Mitchell Fluid Agitators in the Foodstuffs and process industries.*
- It will pay you to consult our specialists with your fluid mixing problems as our extensive experience and wide range of machines enables us to advise on the correct type of machine for your particular mixing application.
- Portable high-speed or medium speed mixers—vertically mounted high-speed and geared models—Turbo agitators—Side-entry mixers—air operated mixers—variable speed mixers. Your enquiries invited for complete units with mixing vessels.

L. A. MITCHELL LTD., 37 PETER ST., MANCHESTER 2

Telephone: BLAckfriars 7224 (4 lines)

Fix. 80

"EASICLEAN" THE PUMP FOR HYGIENE

This completely new, easily dismantled type of Plenty Positive Displacement Pump is rapidly proving its worth throughout the Food Industry. It is suitable for all foods, from milk to sausage meat.

Have you considered the various ways in which pumps can reduce your handling costs and at the same time eliminate the dangers of contamination?

Why not write to Plenty & Son Ltd. on any question of handling by pumps? A special leaflet is available.

- Dismantled and assembled in less than a minute.
- No washers, springs or pins to get lost.
- High volumetric efficiency.
- Available also with stainless dairy couplings.

PLENTY & SON LTD., Newbury, Berks.
Tel: NEWBURY 7 & 1770 Grams: PLENTY, NEWBURY.

Also makers of Variable Positive Displacement Pumps, Mixing Machines in all sizes and Filters.

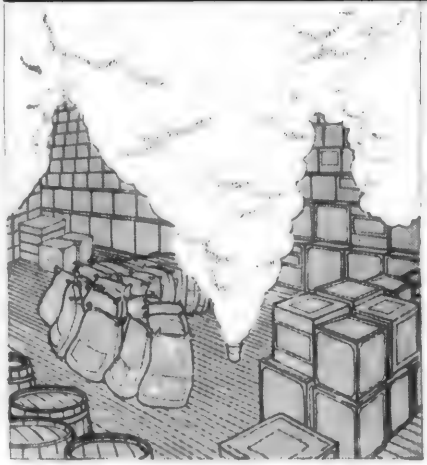
F.M.

PLENTY PUMPS

For bulk supplies insist on BEAR brand HONEY

THE BEAR HONEY CO. LTD., ISLEWORTH, MIDDLESEX Telephone: HOUnslow 3483

With FUMITE premises are PEST FREE



- **FUMITE DDT/LINDANE** General-purpose treatment. Maximum persistence.
- **FUMITE LINDANE** Quicker knock-down; greater penetration. Specially recommended against bed bugs and Pharaoh's ant.
- **FUMITE DIELDRIN/LINDANE** Specially for the destruction of cockroaches.

The speedy way, the sure way, the safe way to clear any premises of insects is to disinfest with FUMITE. These insecticidal smokes penetrate every crevice and, after forcing insects out into the open to die, leave a microscopic deposit on all surfaces—harmless to humans, but lethal to insects for a long time. Foodstuffs in bags, boxes and original containers can stay put, quite safely, during treatment. Labour costs are negligible.

FUMITE REG. **SMOKE INSECTICIDES**

From servicing companies, chemists and through branches of Boots. Write for booklet to:
WAECO LIMITED (FUMITE DIVISION) · High Post · Salisbury · Wiltshire
Telephone: Middle Woodford 282/3/4

*

for a complete power transmission service

CALL IN DICK'S

Fully stocked and technically staffed, the chain of Dick branches throughout Britain gives you the benefit of a prompt advisory and installation Service covering all aspects of power transmission. Dick's accumulated experience of over 70 years in power transmission provides the answers that can save *you* costs.

- **Each Dick Branch carries stocks of Dick products including a fully comprehensive range of vee and flat belts unsurpassed for quality.**
- **Each Dick Branch is represented by technicians and has experienced fitters for installation, conversion and maintenance.**
- **Each Dick Branch is available for consultation without obligation.**

GLASGOW: Greenhead Works, Glasgow, S.E. Tel: BRIdgeton 2344

LONDON: 2 Dufferin Avenue, Dufferin Street, London, E.C.1 Tel: CLErkenwell 2820

BIRMINGHAM: 200 Corporation Street, Birmingham, 4. Tel: CENtral 4460

BRISTOL: Dixel House, Unity Street, Bristol, 2. Tel: 22950 and 22956

MANCHESTER: 77 Bridge Street, Deansgate, Manchester, 3. Tel: BLAckfriars 6861

LEEDS: 4 Eastgate, Leeds, 2. Tel: 30278-9

NEWCASTLE-ON-TYNE: 30 Dean Street, Newcastle-on-Tyne, 1. Tel: 23767

DUNDEE: 11 East Dock Street, Dundee. Tel: 2547

BELFAST: 1 Alfred Street, Belfast. Tel: 26535

DUBLIN: 24 Market Arcade, Drury Street, Dublin. Tel: 72385

Branches in Amsterdam and Vienna. Agencies throughout the world. American factory at Passaic, New Jersey.

THE NAME THAT MEANS DEVELOPMENT IN TRANSMISSION

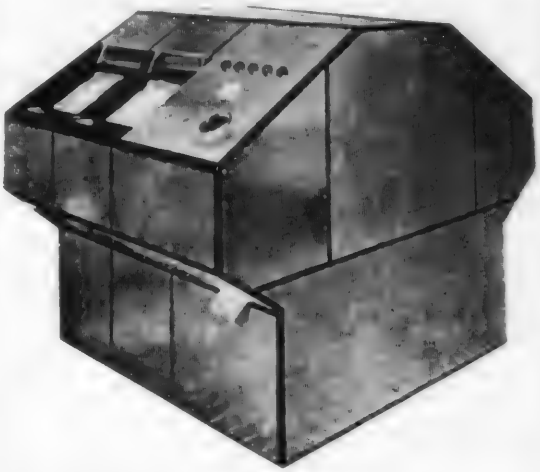
R. & J. DICK, Ltd.

POWER TRANSMISSION ENGINEERS SINCE 1885

GREENHEAD WORKS, GLASGOW, S.E.
Telephone: Bridgeton 2344 Telegrams: Guttapercha, Glasgow.

• FOR MIXING, SEPARATING, PRESERVING •

'AWO'
VACUUM PACK SEALING MACHINES
Make possible indefinite storage of perishable foodstuffs in Airtight Moisture-proof pliable laminates. Continuous Automatic Industrial-scale Models.



'NAUTA'
MIXERS, MICROJET, LUMPBREAKER, (HAMMERMILLS)
for Mixing, Tempering, Conching, Feed Regulating Powders/Liquids/Solids/Viscous Materials, to highest Homogeneity in shortest possible time. Gentle action. Lump-free incorporation of Glucose, Molasses or similar. No clogging.

'REINEVELD'S'
CONTINUOUS CENTRIFUGES
for Separating, Clarifying Liquids (Fruit Juices), Draining off Syrup, De-watering Crystals (Drying of Starch). Highest Capacities, Vertical and Horizontal Models, Non-corrosive.

'SCHEFFERS'
DOWNFLOW MULTIPLE EFFECT EVAPORATORS
Various models built for all requirements.

'KIMMAN'
HIGH SPEED SIFTING & SORTING PLANTS
Suspended Vibrator Models saving maximum of Labour, Space, Time.

'S.A.A.T.I.'
SILK & NYLON INDUSTRIAL SCREENS
Finest quality, high durability. Italian material at most competitive prices.

Machinery and Apparatus for the Food Industries.

• Please consult •

MASON & MORTON
LIMITED
38 VICTORIA STREET, LONDON, S.W.1
Telephones: ABBEY 5512, 5592

From the cradle onwards

Almost everything we see, touch, eat or drink owes its existence in part to woven wire. In many ways, in every industry, woven wire by Begg, Cousland plays a vital role in modern life.

Special qualities and meshes made to specification. Standard requirements supplied immediately from stock.

BEGG, COUSLAND & CO. LTD.
SPRINGFIELD WIRE WORKS, GLASGOW, S.E.

PYPEKOVER

a quicker, cheaper, better way to protect thermally insulated and other pipes

JUST ZIP IT ON AND OFF

This new development for covering pipes and ducts is made from Poly-Vinyl Chloride Sheet and provided with a longitudinal air and water tight "Flexi-grip" slide fastener. It is supplied in lengths up to 100 ft. and in widths to fit pipes up to 75 in. circumference.

Pypekover is the ideal protection for thermally insulated and other pipes in corrosive atmospheres. It is non-inflammable and there are no metallic parts. It does not rot or harden from exposure to weather. Water will not penetrate when pipes are washed or hosed.

Pypekover can be fitted by unskilled labour in a fraction of the time needed for canvas and paint. Can be removed easily and re-used. Many colours for identification. JUST ZIP IT ON AND OFF.

LOCKS IN PLACE

SAMPLE LENGTH with technical details and prices on request.

VICKERYS
LIMITED
4 LAMBETH PALACE ROAD, LONDON, S.E.1
Telephone: WATerloo 7041-2-3

MODERN COFFEE PRODUCTION

A. E. Haarer, F.L.S., Dip. Hort., R.H.S.

The aim of this book is to supply the planter, the student and the field extension officer with an informative and interesting treatise in simple language. The author has endeavoured to say nothing that has not proved sound in practice or been based on the results of reliable research.

If the book has a strong East African flavour, it is not alone because the author has had his practical experience there, but because methods of cultivating coffee in East Africa are now of the highest order and are seldom equalled elsewhere. There are numerous line drawings and over a hundred photographs, some of which were taken by the author himself.

Starting with the early history of coffee, Mr. Haarer discusses at length all aspects of coffee production. There is detailed information on cytology, genetics, environment, shade, lining and holing, pruning, care and maintenance, harvesting, diseases, pests, etc., and a chapter devoted to the economic aspects. In addition, production in Africa, Asia and the Antipodes, and the Western Hemisphere is dealt with in greater detail in separate chapters.

The author's experience began at the age of twenty when he was appointed manager of coffee estates in Uganda. He was directly connected with the formation of the Kilimanjaro Native Planters' Association, now the K.N.C.U. In connection with his botanical collecting work for Kew and the British Museum he was elected a Fellow of the Linnean Society in 1928, and later, in 1930, he took charge of an Agricultural Training School. He now contributes to many journals at home and overseas, and has written several books on fibres.

Royal 8vo. Approx. 500 pages illustrated. 56s. net.

LEONARD HILL [BOOKS] LIMITED
STRATFORD HOUSE, EDEN STREET, LONDON, N.W.1
EUSTON 5911

THE CLEAN AIR ACT and Fuel Efficiency

Hodgkinson offer two types of mechanical stokers for firing shell type and small water tube boilers.
They are both SMOKELESS.
Firstly, the "Low Ram" Stoker of which there are many thousands at work throughout the world; secondly, the Chain Grate Stoker. Both of these will burn efficiently low grade fuels of all N.C.B. rank numbers. These machines are individually designed for each application.

Stoker rental Scheme available

LOW RAM
STOKER

CHAIN GRATE
STOKER

Delivery priority for oil to coal conversion

JAMES HODGKINSON
(SALFORD) LIMITED

Ford Lane Works, Pendleton
Salford, 6, Lancs. Tel: Pendleton 1491

Brettenham House, Lancaster Place, Strand
London, W.C.2. Tel: COVent Garden 2188

THE LAW REQUIRES THAT

ALL FOOD HANDLERS MUST COVER CUTS & GRAZES with a WATERPROOF DRESSING

Get Dalmas dressings from your chemist—in the most conveniently sized box for your business. 2/6 size for small establishments, 10/6 (114 dressings) and 18/6 (180 dressings) for larger ones.

DEFEND HEALTH WITH

Dalmas waterproof dressings keep you well within the latest Food Hygiene Regulations. They are more than waterproof—they're germ and bacteria proof. Use a Dalmas dressing and you can work on in complete confidence that it will not peel off, nor work loose if on an awkward joint. With Dalmas in position you have the best possible defence against infection.

DALMAS
WATERPROOF DRESSINGS
from your chemist or write to . . .

DALMAS LTD · JUNIOR ST · LEICESTER

The JACKSON-CROCKATT

MULTIPLE FILLING MACHINE

FOR FREE FLOWING POWDERS AND GRANULAR MATERIALS

- Fills up to 120 containers every minute.
- Variable speed control allows combined working with other plant.
- Automatic trips prevent waste of materials.
- Quantities easily adjusted while machine is running.
- All parts in contact with product are made of stainless steel.

J. G. JACKSON & CROCKATT LTD

ENGINEERS · THORNLIEBANK, GLASGOW

Telephone: G.FFNOCK 0391 Telegrams: "JAKCRO THORNLIEBANK"

Designers and Patentees of Automatic Filling and Packing Machines from fully Automatic installations to smallest bench types. Also special Automatic Machines and Conveyor and Elevator installations.

KEEP YOUR FACTORY CLEAN BY IMMEDIATE INCINERATION OF ALL DIRT AND WASTE MATERIAL

We can supply Incinerator Plant to meet all requirements

THE INCINERATOR COMPANY LTD

EELGRAVIA CHAMBERS, 72 VICTORIA STREET

LONDON, S.W.1

CECA

REVERSE JET FILTER

Continuous positive removal of micron dusts from air and gas streams

THE BRITISH CECA COMPANY LTD

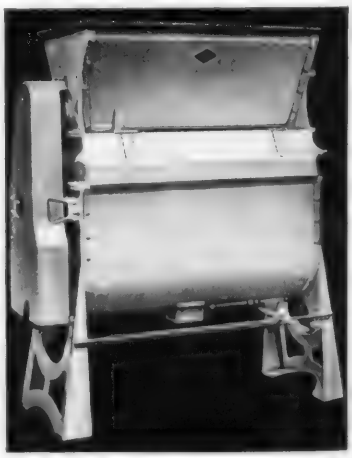
175 PICCADILLY, LONDON, W.1

TEL. HYDE PARK 5131-5

CABLES: ACTICARBON, LONDON

Alite

A unique 3 in 1 Machine for Blending, Sifting and Mixing, in a range of sizes to suit practically all requirements.



The Alite Powder Sifting and Mixing Machine

ALITE MACHINES LTD

Manufacturers of Filling, Sifting and Mixing Machines

PIXMORE AVENUE · LETCHWORTH HERTS

Telephone: Letchworth 965-6

ADD PROTECTION AND GLAMOUR TO SELLING with

Spescopak
POLYTHENE BAGS

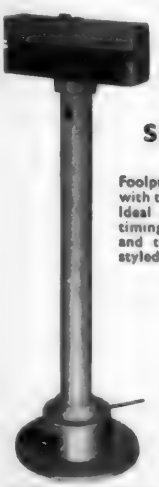
What has glamour to do with selling? Just this—before a sale can be clinched, your product must catch the eye and create a good impression.

And that is where Spescopak comes in.

This tough transparent polythene film available in bags or sheets of various sizes, gives extra sales potential to almost everything. What's more, along with the attractiveness goes protection, for Spescopak is non-toxic, dust and moisture proof, and resistant to most acids.

You may sell biscuits or bread, sugar or sausages, but whatever it is, your product deserves Spescopak, the most versatile packing material.

Find out how glamour steps up your sales. Tell us your packing problems and see what we can do to help.



SEAL IT WITH A 'KisSS'

Foolproof heat-sealing in a fraction of a second—that's what you get with the 'Kisss'. It is the most advanced heat-sealing machine made. Ideal for polythene or any other heat-sealable material. The timing can be regulated from a fraction of a second to one minute, and the temperature controlled by a Simmerstat. Attractively styled and soundly constructed, the 'Kisss' is simplicity itself.

Send now for full information.

Spesco Developments
LIMITED
Hanworth Lane, Chertsey, Surrey
Telephone: Chertsey 2645, 3346, & 2176

TIB 21A

ABBOTT

of

NEWARK

We specialise in Stainless Steel and Nickel Clad Dished and Flanged Vessel Ends. We also manufacture complete Stainless Steel Jacketed Boiling Pans, Coppers, Air Receivers, and all types of pressure vessels. Fabricators of Hoppers.

ABBOTT & CO. (Newark) LIMITED
ABBOTT BOILER WORKS
NEWARK-NOTTS-ENGLAND
Telephone: Newark 34

VERDI
BRAND

1957 Pack Parma

TOMATO PUREE

Guaranteed prime direct August pack for Manufacturers

Special pack for Wholesalers and Caterers in lithographed tins 5 kilos and smaller.

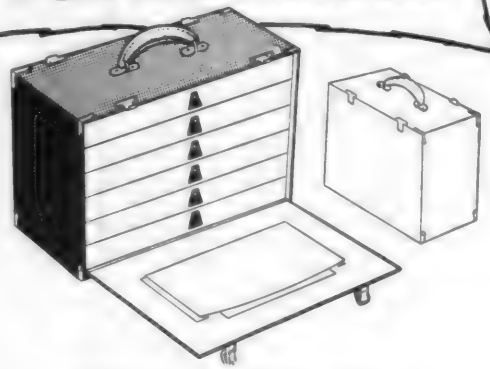
SOLE DISTRIBUTORS IN THE U.K. AND EIRE

PERLA
BRAND

L. I. SILBER & Co. LTD
10 EASTCHEAP • LONDON EC3

SHOW GOODS TO SELL GOODS

SAMPLE CASES... FOR ALL TRADES



Designs submitted for special purposes.
First-class construction by British Craftsmen.
Best quality hide or leather cloth.

PETER CASSIDY LIMITED

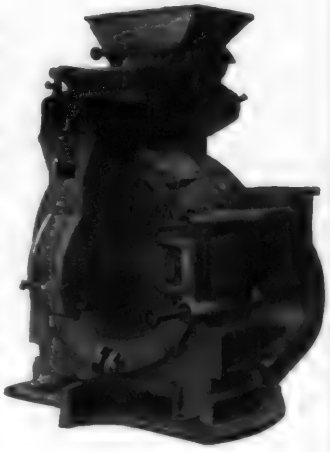
FERENSWAY • HULL

Sample Case Specialists for over 25 years.

BARRON

GRINDING MILLS

Mills for the reduction of all types of materials in food manufacture. Illustrated is our No. 3 size Impact Grinder complete with feeder and suitable for grinding all types of dry materials such as sugar, cereals, roots, spices, etc., to a fine powder. These mills are available in five sizes to deal with capacities of from a few cwt. to 7 or 8 tons per hour.



W. S. BARRON & SON, LIMITED

Phone: 21055 GLOUCESTER Cables: Barron, Gloucester

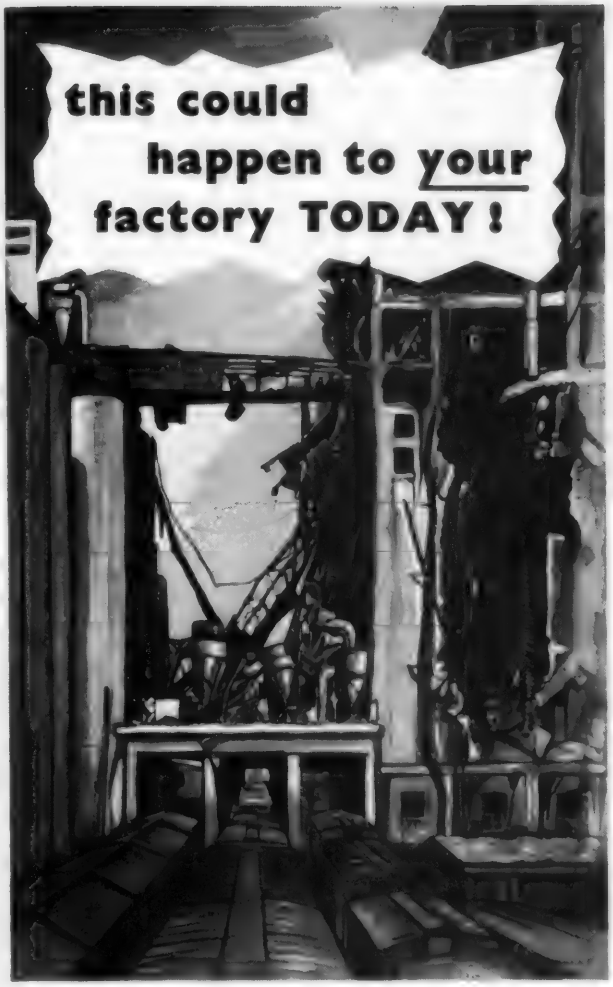
— MINCEMEAT!!! —

for "**Your**" Brand use "**Ashland**"

SHREDDED BEEF SUET

Unrivalled for Quality and Price

MANUFACTURED BY
BRITISH AMERICAN PRODUCT CO. LTD., VITTORIA WHARF, CATHCART STREET, BIRKENHEAD
Telephone: BIRKENHEAD 1540 (3 lines). Telegrams: "BAPCO" BIRKENHEAD



The matter is an urgent one. The illustration above depicts the result of a recent dust explosion. This explosion caused complete cessation of production. Twenty men were killed or injured, and claims for damage and injury to works and personnel in the vicinity amounted to more than £1,425,000. This could have been avoided by the installation of the appropriate GRAVINER INDUSTRIAL EXPLOSION EQUIPMENT.

Write or 'phone today for our brochure "Explosion Protection and Suppression."

INDUSTRIAL EXPLOSION PROTECTION & SUPPRESSION *by*

GRAVINER

MANUFACTURING COMPANY LTD

29 St. James's Street, London, S.W.1. Tel.: WHitehall 6478
Fareham Road, Gosport, Hants. Tel.: Gosport 89175

Specialists in Industrial Thermostats, Overheat Switches and Airborne Fire Protection Equipment.

DEHYDRATED VEGETABLES FRUITS and HERBS

FOOD FACTORIES IN NORTORF AND BUTTENHEIM, GERMANY

Asparagus, carrots, cabbage (red, green, white, savoy), celery, french beans, green peas, horse-radish, leeks, onions, garlic, parsley, potatoes, tomatoes, turnips, spinach, brussels sprouts, beetroots, scorzoneras

Mushrooms, champignons, chanterelles

Medicinal herbs, seasoning herbs, mint

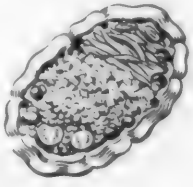
Bilberries, rose hips, rowan berries, apple rings

Dehydrated Meat
boned chicken and beef

FOR EVERY PURPOSE

diced, sliced, kibbled, granulated, flaked, grated or in powdered form.

Quick Frozen Foods Division
vegetables and fruits:
brussels sprouts, spinach, french beans, green peas, parsley, potatoes, mushrooms, bilberries



PLEASE WRITE TO HEAD OFFICE:

BRÜCKNER-WERKE
KOMMANDITGESELLSCHAFT

Asia House, Hamburg 11, Germany

Cables: brücknerwerke

Telephone: Hamburg 32 68 71

SOYA FLOUR

THE CHEAPEST PROTEIN SUPPLEMENT

to increase the Food Value of such foods as

SOUPS • SAUSAGES • PUDDINGS • CAKES

The Highest Quality Soya Flours are manufactured specially for the Food Trades by:

THE BRITISH ARKADY CO. LTD.
SKERTON ROAD · OLD TRAFFORD · MANCHESTER 16

SAVE 50% OPERATIVE TIME

with the

AGMA 'EZP'
PNEUMATIC BAG OPENER
The ONLY machine of its kind.

AUTO WRAPPERS
WRAPPING MACHINES
FILLING MACHINES
UNIT CONVEYORS · BAG PACKERS
and all PACKAGING WANTS

Write or Phone:

AUTO WRAPPERS (SALES) LTD
2 The Broadway, Hammersmith, London, W.6
Phone: RIVerside 7660

1st to 22nd September, 1957

Large Survey of ENGINEERING TECHNOLOGY

The Third Czechoslovak Engineering Exhibition ranges with its extent among the largest engineering exhibitions of the world.

The two preceding exhibitions were surprising with their rich selection of novelties and excellent technology. Also the third exhibition will display newly designed and improved machines as well as complete production plants which will be demonstrated in operation.

Information can be obtained from the commercial department of the Czechoslovak Embassy or directly from the

CZECHOSLOVAK CHAMBER OF COMMERCE
Praha, Ulice 28. října č. 13, Czechoslovakia

THE THIRD CZECHOSLOVAK ENGINEERING EXHIBITION BRNO

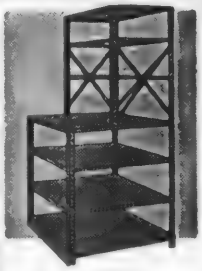
CANNING TOWN GLASS WORKS LTD.,
30-34 NEW BRIDGE STREET, E.C.4
Telephone: CENTRAL 5342-5 *Telegrams: DRYAD, LUD, LONDON*
WORKS: CANNING TOWN, E.16 and QUEENBOROUGH, KENT

Erect it yourself with

ABIX ADJUSTABLE STEEL STORAGE EQUIPMENT

THE EFFICIENT INEXPENSIVE ANSWER TO ANY STORAGE PROBLEM

ABIX STEEL STORAGE EQUIPMENT is supplied in a number of INTERCHANGEABLE Standard Components; from these an infinite variety of racks can be assembled easily and rapidly by unskilled labour. The components are stove-enamelled olive green, whilst all fixing bolts are galvanised or sheradised.



Normal Standard Dimensions:

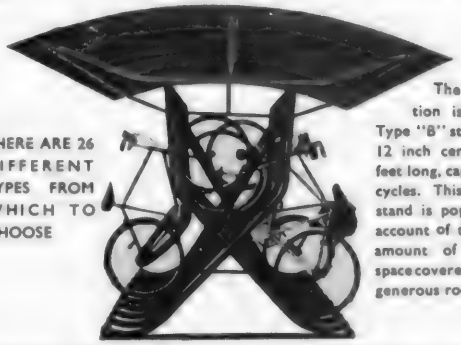
HEIGHT
75", 78", 99", 111", 123"

WIDTHS
24", 36", 48"

DEPTHS
9", 12", 18", 24", 36", 48"

ABIX CYCLE STANDS

ABIX Cycle Stands are constructed of steel throughout, stove-enamelled green. Roof sheeting is normally of galvanised corrugated sheets. If, required sheeting can be supplied in Aluminium, Asbestos or Robertson Protected Metal.



THERE ARE 26 DIFFERENT TYPES FROM WHICH TO CHOOSE

The illustration is of our Type "B" stand with 12 inch centres, 10 feet long, capacity 20 cycles. This type of stand is popular on account of the small amount of ground space covered and the generous roof cover.

ABIX *NEW TYPE* STEEL CLOTHES LOCKERS

ABIX CLOTHES LOCKERS are of All Steel construction, with separate hat and coat compartments. Single units or banks of two, three or four. Stove-enamelled Olive Green. With Lock and diecast Handles.

STOVE-ENAMELLED GREEN FROM STOCK. COLOURS TO ORDER

SIZE OF SINGLE UNITS:
72" high
12" wide
15" deep
and in 12" deep.

SUPPLIED IN EITHER SINGLE, DOUBLE, THREE TIER OR FOUR TIER

Write for illustrated Catalogue

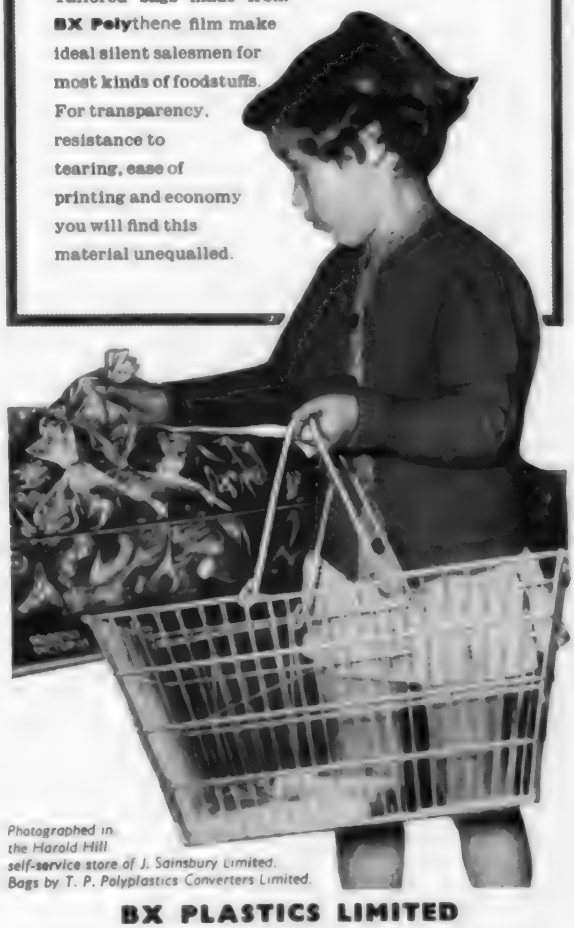
ABIX

METAL (INDUSTRIES) LTD
FACTORY EQUIPMENT SPECIALISTS
TAYBRIDGE HOUSE, TAYBRIDGE ROAD
BATTERSEA, LONDON, S.W.11
Tel: Battersea 8666/7 *Grams:* Abix, Batt, London

The housewife of tomorrow is learning to expect goods hygienically packed in

BX Polythene

Tailored bags made from **BX Poly**thene film make ideal silent salesmen for most kinds of foodstuffs. For transparency, resistance to tearing, ease of printing and economy you will find this material unequalled.



Photographed in the Harold Hill self-service store of J. Sainsbury Limited. Bags by T. P. Polyplastics Converters Limited.

BX PLASTICS LIMITED
A Subsidiary of The British Xylonite Co. Ltd.
Higham Station Avenue, London, E.4. Tel: LARkswood 5511

The EXCELLENCE in Tomato Puree

WE SHIP DIRECT TO U.K
ON C.I.F. AND L.D.P. BASIS

ASK FOR SAMPLES
AND QUOTATIONS

valrecchio
S.p.A.
PARMA ITALY

STAINLESS
food handling
EQUIPMENT

★ NEVER CORRODES
★ LEAVES NO TAINT
★ EASILY CLEANED

Made to meet exacting conditions and special requirements.

A Stainless Steel Tipping Jacketed Pan is illustrated.

Tanks of all kinds, containers, utensils, etc., in light or heavy gauge.

"STAYBRITE" STAINLESS STEEL

MONEL METAL, COPPER, STEEL, or ALUMINIUM

Associated Metal Works
(GLASGOW) LTD.
30 ST. ANDREW'S SQUARE, GLASGOW, C.1
Phone: BELL 2004/6 *Grams:* "STAINLESS, GLASGOW."
and at LIVERPOOL, MANCHESTER, BELFAST & DUBLIN

LONDON:
7 Grosvenor Gdns.,
S.W.1.
Phone: VICTORIA 1977/8

METABISULPHITE OF POTASH

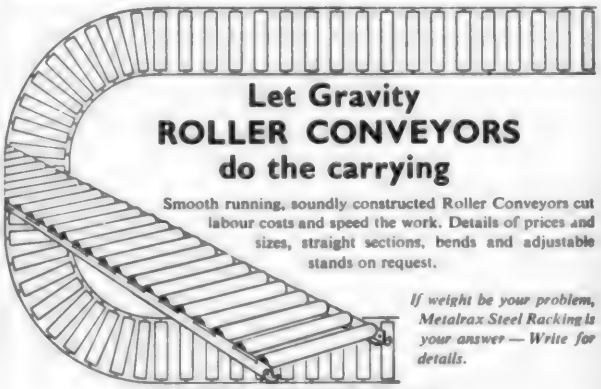
Effective Preservative for all kinds of Foods and Drinks
Maximum SO_2 Content

GRADED CRYSTALS, POWDER AND TABLET FORM

Write for samples, prices and analysis to:

F. KENDALL & SON LTD.
STRATFORD-ON-AVON

TELEPHONE: STRATFORD-ON-AVON 2031



Let Gravity ROLLER CONVEYORS do the carrying

Smooth running, soundly constructed Roller Conveyors cut labour costs and speed the work. Details of prices and sizes, straight sections, bends and adjustable stands on request.

If weight be your problem, Metalrax Steel Racking is your answer — Write for details.

JAMES OSCARD & CO.
(Dept. FM) 139 Whitton Rd., Twickenham, Middx. *Phone:* POPesgrove 5281

LeBelle
BRAND

Packed by:
F. VITELLI & FIGLI, NAPLES
ESTABLISHED 1920

LE BELLE Peeled Plum Tomatoes · LE BELLE Tomato Puree
LE BELLE Tomato Juice · LE BELLE Cherries
LE BELLE Peaches · LE BELLE Apricots
LE BELLE Artichokes · LE BELLE Pimentoes
LE BELLE Whole Stringless Beans

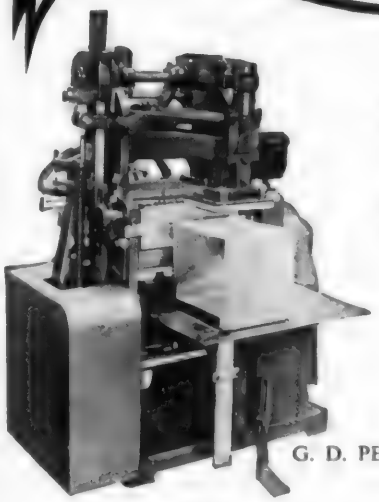
Importers and Sole Distributors in the U.K. AND EIRE

L. I. SILBER & CO. LTD
10 EASTCHEAP + LONDON E.C.3

The Biscuit Tin is coming back into its own again!

THANKS TO THE
PONY LABELRITE LABELLING M/C

This is news! The Peters Labelrite Machine now labels accurately, economically and without trouble, those LARGE biscuit tins. This achievement is of special significance to all users of large tins, and it should be remembered that the Pony Labelrite Model MLLX can take care of Band and Face Labels and is equally suitable for labelling Fibreboard Biscuit Containers.



NOW—CHECK THESE FEATURES

1. No driers or drying time required.
2. Very large saving in wages.
3. Minimum adhesive applied, saving in adhesive costs.
4. No rust spots—tin life prolonged.
5. Labels come away completely in washer.
6. No double handling—tins can be stacked immediately.
7. Accurate register—better pack appearance.
8. Maximum economy of floor space.
9. All over gluing of the labels.
10. Variable speed 30-60 per minute.

The Scottish Adhesive Co. manufacture a special adhesive for use with this application.

PETERS
OF SLOUGH

G. D. PETERS & CO. LTD., ENGINEERS (PACKAGING DIVISION), SLOUGH, BUCKS, U.K.
TELEPHONE: SLOUGH 23201 TELEGRAMS: "PETERS" SLOUGH.

IS THIS YOUR PROBLEM?

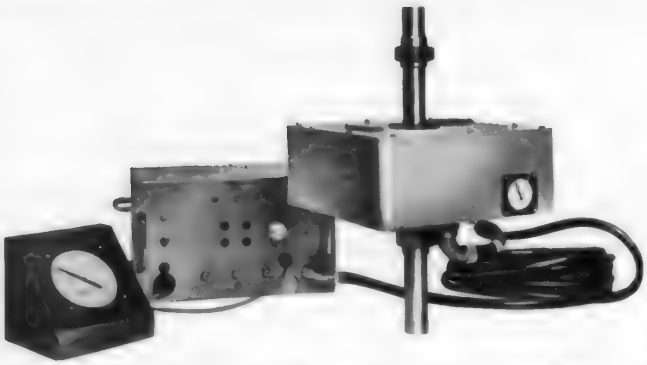
The Howard 'M' Type Stainless Steel Easy Clean Rotary Pump is a robustly constructed piece of machinery especially designed to solve difficult pumping problems. It handles delicate materials—even those with a high V.I.—without any agitation or contamination. The pump can, when necessary, be jacketted for heating, or cooling if required. **MANY USES:** The 'M' Type Rotary Pump is exceptionally versatile. It is available in seven sizes, giving from 15 to 15,000 g.p.h. for heads up to 200 ft. It has found wide and varied use throughout the food and chemical industries.

If so—the answer is a

Howard 'M' TYPE ROTARY PUMP

ALSO MANUFACTURERS OF HOWARD TRIPLEX, CENTRIFUGAL AND PROPORTIOMETER PUMPS

For further information, please write to:
HOWARD PNEUMATIC ENGINEERING CO. LTD., PORT ROAD, EASTBOURNE.
TEL: EASTBOURNE 1179.
GRAMS & CABLES: HOWMATIC, EASTBOURNE



PRECISION BS INSTRUMENTS

Recording Refractometer
giving remote indication

For the continuous indication of refractive index or function thereof, over a span of between 0.015 and 0.025 refractive index, of transparent materials following in a pipeline.

Chart recording can be easily accommodated and, in many applications, control to the plant may be achieved. The pipeline carrying the material is of F.M.B. grade stainless steel, 1½" nominal diameter, fitted at either end with A.P.V. couplings, male part.

Bellingham & Stanley Ltd. DEPT. FM, 71 HORNSEY RISE, LONDON, N.19
PHONE: ARCHWAY 2270

FULLER HORSEY
SONS & CASSELL

Specialists in the Sale & Valuation of

FOOD MANUFACTURING PLANTS
OF EVERY DESCRIPTION

Since 1807

10 LLOYDS AVENUE · LONDON · E.C.3
TELEPHONE · ROYAL 4861 Rathbone

WOVEN WIRE

F. W. POTTER & SOAR LTD.

Our range of Weaving covers all grades from the FINEST WIRE CLOTH to the HEAVIEST SCREENING.

Also makers of
SIEVES
SCREENS
DRESSING COVERS
TRAYS
BASKETS
and many other Wire Products.

Write for our brochures of Woven Wire and Wirework.

PHIPP STREET
LONDON E.C.2

Telephone · BIShopsgate 2177 (3 Lines)

STAINLESS STEEL
BAR · SHEET · STRIP
go to
CASHMORES

JOHN CASHMORE LTD., STEEL STOCKHOLDERS
GREAT BRIDGE, TIPTON, STAFFS. Tel.: Tipton 2181/7
SM/JC. 2404/2.

For all Railway Enthusiasts

ELECTRIC TRAINS AND LOCOMOTIVES
by B. K. COOPER

Demy 8vo *Illustrated* *xvii + 111 pages*
Price 15s. net. Postage 9d. Home, 10d. Abroad

Electric Trains and Locomotives is written for all who are interested, whether as railwaymen, students of electricity or railway enthusiasts, in the developments of technique and the extension of electrified services now taking place in many parts of the world. The basic theory of the electric motor and the various electrical effects associated with its operation are explained by means of examples and simplified circuit diagrams based on modern locomotive and rolling stock practice.

Obtainable through your usual bookseller.

LEONARD HILL [BOOKS] LIMITED
STRATFORD HOUSE, EDEN ST., LONDON, N.W.1

FRESH **FRUIT** AND **PULPS**

Send your enquiries to the **Producers**

THE BEDDINGTON NUT & PRODUCE CO. LTD.

HIGHLANDS HILL, SWANLEY, KENT
Telephone: Swanley Junction 2306/7
Telegraphic Address: "Namsoluc, Swanley, Orpington"

SITUATIONS VACANT

PRODUCT Development Assistant. A progressive and rapidly expanding company has a vacancy for a Product Development Assistant in its Development Department for the pioneering of recipe formulation, production techniques and the handling of Pilot Lines for pies and pastry. Applicants should have had experience in pastry manufacture and baking, preferably having obtained a qualification. The position carries attractive conditions and is situated in a seaside town. Starting salary not less than £900 p.a. Age 25/35.—Please write stating full details of training and experience to Box B5560.

QUALIFIED Analytical Chemist required to control Laboratory of established Food Manufacturing Co., S.E. London district. Must be capable of quality control work and development of new products.—Write age, salary required, experience and qualifications to Box Z.C.316, Deacon's Advertising, 36, Leadenhall Street, E.C.3.

TECHNICAL Advisers. Fisons Milk Products Limited, a member of the Fison Group of Companies, propose to establish a small Technical Advisory Service to introduce their new product "Cockade PRM" to the cheese industries of the world. Applications are invited from persons of 25 to 35 years of age and holding a recognised qualification in Dairying. Practical experience of cheese-making is desirable but not essential. These are permanent appointments with a good salary and superannuation.—Applications giving full details of age, education and experience, should be addressed to the Personnel Officer, Fisons Milk Products Limited, 12, Derby Road, Loughborough, Leics. Please quote reference 27.

ASSISTANT Production Manager with knowledge of Meat, Fruit and Vegetable Canning required by canning factory in North-West.—Write stating age, experience and salary required to Box B5559.

THE Research and Development Division of Petfoods Limited require the services of a qualified Chemist or Physicist to undertake laboratory investigations mainly of a physical nature. Some experience in the food industry would be an added qualification but is not essential. A starting salary of not less than £1,000 per year will be paid and the Company operates a comprehensive social security plan which covers non-contributory pension, sickness benefit and life assurance. Assistance will be given with housing.—Applications giving details of education and career to date should be sent to the Chief Personnel Officer, Petfoods Limited, Melton Mowbray, Leicestershire.

A VACANCY exists for a young lady (20-30 years) for development work in flavour laboratory. Experience or good knowledge of the flavour or food industries and qualifications desirable. Salary according to age, experience and qualifications.—Apply in writing to: The General Manager, Polak and Schwarz (England) Ltd., 50, Great Cambridge Road, Enfield, Middlesex.

G. BRAZIL and Co. Ltd., Winchester, will shortly be requiring a departmental Manager to take charge of their Pie Bakery. Must be capable organiser and controller of staff. Five-day week. Pension scheme.—G. Brazil and Co. (Winchester) Ltd., Easton Lane, Winnall, Winchester, Hants.

EXPERIENCED Engineer required for modern Canning and Quick Freezing Factory in East Midlands. Post only suitable for someone active and ready for hard work. Good prospects.—Apply Box B5567.

WELL-KNOWN Food Manufacturers require young lady Graduate Chemist for analytical work and quality control in Cambridgeshire factory.—Box B5548.

CLASSIFIED ADVERTISEMENTS

FOOD MANUFACTURE

MUST BE PREPAID

4d. a word, minimum 10s.

Box numbers, 1s. extra.

Replies to

BOX NUMBERS

should be addressed to

Food Manufacture, Stratford House, 9 Eden Street, London, N.W.1

SITUATIONS VACANT

EDIBLE OIL and FAT COMPANY IN EAST YORKSHIRE require CHEMIST and TECHNICIAN with experience in the compounding and technical application of edible oils and fats used in the baking and confectionery trades. It will also be an advantage if he can act in a technical advisory capacity to the Baking and Confectionery Industry. This is interesting new development work. Applicants should have a degree and preferably experience in the baking and confectionery industries. Salary will be in accordance with age, qualifications and experience. Superannuation Scheme, Sports and Social facilities.—Write giving full particulars to Box B5562.

QUAKER Oats Limited require a qualified chemist who has had experience in the Food Industry. This post is concerned with investigational and research projects. It is a position of responsibility where ability to control and direct staff is essential.—Please write, giving age, details of qualifications and experience, and salary required to Personnel Manager (C.84), Quaker Oats Limited, Bridge Road, Southall, Middlesex.

BUSINESS OPPORTUNITIES

CHELSEA POLYTECHNIC
(College of Advanced Technology)
Manresa Road, S.W.3

DEPARTMENT OF BOTANY AND ZOOLOGY

(A) Courses in general and advanced Microbiology will begin on September 27, 1957.
(B) Courses of lectures, with practical work on "Metabolism of Micro-organisms" on Mondays 6-9 p.m., beginning September 23, 1957.

Tuition fees: (London students). Course A (September to June), 40s. (first year); 40s. (second year). Course B (September to Easter), 40s.
Intending students should write to Head of Department of Botany and Zoology, before August 31, 1957. Enrolment September 18, 6-7.30 p.m.

ATTENTION Sausage Manufacturers. Scandinavian food manufacturer, desirous to manufacture a new product in England, wishes to establish co-operation with a British sausage manufacturer, preferably in London.—Please reply Box B5566.

FULL Steam in five minutes with B. and A. Electrode Boilers, used by British industries for twenty-five years. No boilerhouse, no flue, no attendant needed. The most compact and convenient steam raisers available, can go beside machines using the steam.—Write for Leaflet 125, Bastian and Allen Ltd., Ferndale Terrace, Harrow, Middlesex.

DE-GREASING and Cleaning Down. One man can do the work of five with B. and A. steam - cleaning - with - detergent equipment; ready for use from your own steam supply. "Speedylectric" high-efficiency steam lance; 30 ft. steam hose; 15 ft. detergent hose; £44 complete. Ideal for the Food industry.—Leaflet L.125 Hyzone Ltd., 2 Rosslyn Crescent, Harrow, Middlesex.

BUSINESS OPPORTUNITIES

WELL-ESTABLISHED agents with first-class connections are desirous of obtaining the agency of top quality manufacturers of Machinery for all aspects of Food Manufacturing and Bottling Industries. Principal will be in England September, October.—Please reply first instance to H 750, Box 1142, Cape Town.

TIME RECORDER RENTALS LTD., 157-159, Borough High Street, London, S.E.1. Tel.: HOP 2230.

DRAKESONS

(GENERAL METAL SPINNERS) LIMITED

CAPACITY UP TO 72" IN ALL METALS

SPECIALISTS IN STAINLESS STEEL HYDRAULIC SPINNING

SHEET METAL ENGINEERS

21 PARKHOUSE STREET, CAMBERWELL, LONDON, S.E.5. RODney 5426 and 5427

INDIA. Subsidiary of London Merchant Company established in India for nearly a hundred years offers finance, local knowledge and all administrative services to Food Manufacturer who would contribute technical assistance and possibly finance to a joint project for the progressive production in India of canned soups, bottled sauces, chutneys and pickles, and other packed foods.—Please address Box B5558.

SECOND-HAND PLANT WANTED

WASHING Machine in good condition, suitable for washing trays and dishes of various sizes.—Reply to Box B5561.

REQUIRED: Second-hand, copper, non-tilting "Kellie" Fast Boiling Pan, with coil inside, diameter at top of pan 36 in., depth inside 31 in., steam pressure 70 lb. State price and year of manufacture.—Box B5565.

FORMOSAN PINEAPPLE

TAI-YU

BRAND

104 OZ. TINS (and SOLID PACK) in 9 DIFFERENT VARIETIES OF CUT

- WHOLE SLICES
- SPIRAL SLICES
- HALF SLICES
- QUARTER SLICES
- TIDBITS ($\frac{1}{5}$th Slice)
- PIECES ($\frac{1}{10}$th Slice)
- CUBES (15 mm.)
- COCKTAIL CUBES (10 mm.)
- CRUSHED

- *Grown from Hawaiian seed in modern hygienic conditions.*
- *Shipments to all main United Kingdom ports.*
- *For samples and prices please write to main distributors:*

S. DANIELS & CO. LTD.

15 CROSSWALL, LONDON, E.C.3

Telephone: ROYAL 3386 (5 lines)

MISCELLANEOUS SALES

SECOND-HAND Sectional Timber Buildings completely reconditioned, delivered free 100 miles. 24 ft. by 12 ft. £102; 30 ft. by 15 ft. £138; 30 ft. by 18 ft. £154; 60 ft. by 20 ft. £302. Floors extra.—Universal Supplies (Belvedere) Ltd., Crabtree Manorway, Belvedere, Kent. Tel.: Erith 2948.

TRAYS. Heavily galvanised, perforated, mild steel stacking trays: size 25 in. by 6½ in. by 11½ in.; price 4s. each—discount on quantities; ideal for food and fish industries; send P.O. for sample.—Alfred's Ices (1954) Ltd., 3/5, Hall Place, London, W.2. Tel.: PAD. 6619.

PAPER Sacks, Medway, plain and unprinted. Four ply including two bitumen, 26 in. by 16 in. by 3 in. Latex sealed bottom. Approximately 1,400 available. £35.—Byprofood Limited, Clopton, Nr. Woodbridge. Tel.: Grundisburgh 294.

FOR Sale: 250 gal. well-known brand Lolly Syrup, various flavours, as bargain, in free 1 gal. glass jars.—Box B5556.

DRIED VEGETABLES
DRIED HERBS
SEEDS & SPICES
GROUND PAPRIKA

•

AGRICULTURAL AND CHEMICAL PRODUCTS LTD.
51 & 52 BARBICAN, LONDON, E.C.1
Telephone: Monarch 6124-6 (3 lines)
Telex: London 23596

CLASSIFIED ADVERTISEMENTS

in FOOD MANUFACTURE

MUST BE PREPAID

4d. a word, minimum 10s.
Box numbers, 1s. extra.

Replies to
BOX NUMBERS
should be addressed to
Food Manufacture, Stratford House, 9 Eden Street, London, N.W.1

FACTORIES FOR SALE

BERMONDSEY. 32,000 sq. ft. Modern Factory on Ground, First and Second Floors; part newly built. Second floor North lighted. Reinforced concrete floors. Lofty Ground floor of 16 ft. 1 ton lift. Boiler plant supplying trade steam and central heating throughout the works, with wash-down facilities for wet trades. Electric power and all services. Freehold for Sale.—Apply to Chamberlain and Willows, 23, Moorgate, E.C.2. Tel.: MET 8001.

LETCHWORTH. Attractive Modern single-floor Factory (lofty), and two floor offices. 4,000 sq. ft. plus land for extension. Convenient loading. Immediate possession. Rent £1,250 p.a. excl., on lease, or for Sale.—Chamberlain and Willows, 23, Moorgate, E.C.2. Tel.: MET 8001.

MISCELLANEOUS WANTS

FOOD Manufacturer possessing formula exceptional and outstanding made-up potato crisp in six flavours requires capital development and/or facilities to manufacture, fry and pack.—Box B5568.

WANTED urgently: Stainless Steel, obsolete and scrap equipment. Top market prices paid in cash.—Write or phone particulars to H. and D. Co., 47, Rosebank Road, Hanwell, London, W.7. Tel.: Ealing 0164

STONE Jars wanted to purchase. Any district.—Full particulars to T. Gunn (Rayleigh) Ltd., 206, London Road, Rayleigh, Essex. Tel.: Rayleigh 87.

DAMAGED or redundant stocks of food, residues or by-products in large or small quantities required.—Send your offers to Rotunda Foods Co., London Office: 50/52, Blandford Street, W.1. Tel.: Welbeck 8465.

WE are large buyers of: (1) Wooden Barrels; (2) Light Steel 40/50 gal. Drums.—The Liffey Cooperage Co., 6, Pim Street, Dublin.

WANTED

Diesel engines. Diesel generator sets. Any type surplus diesel plant. Immediate cash. We clear if required. P. R. Lowe and Co., 34a Rainham Road, London, N.W.10. Tel.: LAD 4005.

The Strongest Vanilla Flavour
VANOLEUM
1 oz. (2/6) makes a pint of essence
4 ozs. 8/6. ½ lb. 16/6. 1 lb. 32/-
For further details apply:
ARTHUR WHITTAKER & CO. LTD.
30 Church St., Newton Heath, Manchester, 10

World Crops

PUBLISHED MONTHLY

The recognised international authority on agriculture.

Reviews recent advances in the application of science to agriculture, including soils, fertilisers, cultivation, irrigation, control of pests and diseases, improved crop varieties, farm machinery, crop rotations, pasture management, processing crops, and many other matters.

Its articles, written by leading authorities in simple and, so far as possible non-technical language and profusely illustrated, cover the main crops of agricultural importance throughout the world.

Tea, Rubber, Sugar, Coffee, Tobacco, Sisal, Cocoa, Cotton, Rice, Jute, Coconut, Bamboo, Arrowroot, Pepper, Wheat, Barley, Maize, Oats, Fruits.

Specimen copy on request.
Annual Subscription 50/-, post free.

Leonard Hill Limited
9 Eden Street, London, N.W.1

SECOND-HAND PLANT FOR SALE

COMPLETE Flaked Cereal Manufacturing and Packing Plant comprising Rotary Louvre Drier, Syrup Mixing Equipment, Pressure Cookers, Curing Bins, Flake Rolls, Toasting Ovens and complete Pneumatic Packing Line consisting of Carton Maker, two Liners, six Weigher/Fillers, Top Sealer and Pressure Band Sealer. Also available are some screw conveyors, bucket elevators and cooling conveyor together with tote bin system for feeding the packing line. Plant may be inspected as installed.—Further particulars apply Box B5563.

PLANT FOR SALE

350 gal. stainless steel Tanks, Benhil Butter and Margarine Packer, stainless steel interior Milk Cooling or Cream Ripening Vat, Pasteuriser, Southall and Smith 2-lb. automatic Flour Weighing Machine, Mixers, Kneaders, Racks, Provers, Baking Sheets, etc. Your enquiries welcomed. — Sorensen Bakery Equipment Ltd., 42, Raby Street, Manchester 16. Tel.: Moss Side 2054/4054. Grams: Rahbek.

"CREAM-MASTER" Cream Whipping Machines. Unsurpassed for quality of whipped product and economies effected.—Sorensen's, 42, Raby Street, Manchester 16.

BRATBY fully-automatic Neck and Body Bottle Labelling Machine for sale. In perfect condition, very little used.—For further details please write to J. Skrek and Co. Ltd., Canton Market, Cardiff.

"FRIGIDAIRE" low-temperature Refrigerators. Reconditioned, fitted with new sealed Unit, five years guarantee. 49 in. w. by 28 in. d. by 34 in. h. For deep freezing, storage of ice cream, frozen food, etc. Price £85 each. Domestic Refrigerators, Service Cabinets and Cold Rooms also available.—A.R.C., 130, Great Portland Street, London, W.1. Tel.: MUSeum 4480.

ROTARY Drum Drier by Robert Boby. Ideally suitable for drying bread, cereals and other materials. Fitted with hydra oil burning furnace, thermostatically controlled, with radiovisor control. Brooks 5 and 10 h.p. 3-phase motors and starters. All complete with Sirocco fan, in perfect condition.—Byprofood Ltd., Clopton, near Woodbridge. Tel.: Grundisburgh 294.

ALBRO 10-head rotary stainless steel Vacuum Liquid Filling Machine with self-contained A.C. motor drive, capacity approx. 150 dozen bottles per hour. Suitable for filling wine, spirits, etc., but easily adjustable for squashes and other liquids. New 1951 and in first-class condition.—Apply C. Skerman and Sons Ltd., 118, Putney Bridge Road, London, S.W.15. Tel.: Vandyke 2406.

PACKOMATIC type automatic Case Sealing Machine, adjustable for various sizes of cardboard cases and complete with motor drive and discharge conveyor. Perfect condition throughout.—Apply Box B5569.

PHONE 98 STAINES

Three new 75 gal. stainless steel jacketed Pans. "Crypto" electric Potato Peeler, 12 in. by 8 in. chamber. Two enclosed jac. fin blade all gunmetal Mixers, 30 in. by 27 in. by 24 in., by Melvin. Unused portable Stirrers, ½ h.p., 440/3/50. Jac. cyl. vacuum Ovens, 3 ft. 6 in. by 1 ft. 6 in., 6 ft. by 3 ft. 6 in., 7 ft. by 3 ft., 7 ft. 6 in. by 3 ft. 6 in., 7 ft. by 5 ft. and 8 ft. by 5 ft. Jac. trough worm Conveyor, 12 ft. long by 12 in. by 15 in. Three s.s. lined Autoclaves, 6 ft. by 3 ft., 100 w.p. "Z," fin, "U" trough and cylindrical jac. and plain mixers. Grinders, crushers, edge runners, refiners, disintegrators, filter presses, pumps, hydros, etc.—Harry H. Gardam and Co. Ltd.

SURPLUS Machinery for disposal: Gardner Mixer, Joseph Baker Melangeur, three Briskwrap Wrapping Machines, several Douglas Wrapping Machines, Ratti Cream Spreader, two S.I.S. Bar Wrappers, Philips X-ray Machine. No reasonable offer refused.—Facchino's Biscuits Ltd., Ward End, Birmingham, 8.

SECOND-HAND PLANT FOR SALE

600

PLANT FOR THE MANUFACTURE OF MARGARINE

FOUR Horiz. stainless steel Blenders by Johnson, 5 ft. by 3 ft. by 3 ft. with welded steel jacket, bottom end outlet; split stainless steel lid with handles and two 10 in. diam. openings. Agitator of stainless steel tubular whisk type with glanded bearings, direct coupled to 2 h.p. Brook motor, 400/440/3/50, through Croft reduction gear, 1440 : 38. Jacket fitted thermometer pocket one end, bottom connections, and top overflow. 2,000 lb. working capacity.

2-ton capacity Chilling Unit by Hardaker, comprising stainless steel Chilling Machine direct expansion ammonia type, drum 4 ft. 6 in. face by 4 ft. diam., spray feed, doctor knife, etc. Drive by 8 h.p. tot. encl. motor, 400/440/3/50. Discharging to Portable Inclined Flat Belt Conveyor by Audley Engineering, 22 ft. centres with 18 in. wide balata belt. Thence to stainless steel Twin-screw Complector, working temp. 44·5°F., driven by 40 h.p. motor, 400/440/3/50, with 2 h.p. vacuum pump.

1-ton capacity Chilling Unit by Johnson, comprising m.s. Chilling Machine, drum 4 ft. 7 in. face by 2 ft. 10 in. diam., driven by 6 h.p. Brook motor, 400/3/50. Discharging to Portable Inclined Flat Belt Conveyor by Audley Engineering, 22 ft. centres with 18 in. wide balata belt. Thence to stainless steel Complector, details as for 2-ton plant.

Motor-driven stainless steel Emulsifying Pump by Hardaker, suitable for 1-ton chilling plant.

Bulk Packing Machine by Hardaker, fitted two cradles and wire cutting for 28 lb. and 56 lb. blocks, driven by 6 h.p. motor, 400/440/3/50.

Wrapping Machine by Benhill, Model 27, ½ lb. capacity, speed 60 per minute.

Six jacketed Open Top Rectangular Vats by Harburger, 30 cwt. capacity, m.s. constr., 5 ft. 8 in. long by 3 ft. 7 in. wide by 3 ft. 2 in. deep, with side bottom 2 in. i.d. outlet, jacket suitable water and steam.

Two m.s. Open Top Cylindrical Dished Bottom Pans, 5 ft. diam. by 4 ft. deep, with 2 in. centre bottom outlet, and fitted split hinged lid.

Two stainless steel Agitated Mixers or Ageing Vats by Cherry Burrell, Model P. No. 124, approx. 3 ft. 8 in. diam. by 3 ft. 8 in. deep, vertical propellor agitator, supported from bridge across top. Vat insulated and fitted bottom side outlet.

Jacketed Tempering Kettle or Mixer, approx. 4 ft. by 4 ft. 2 in. deep, 1 ton capacity, riveted m.s. constr., fitted overdriven gate-type agitator driven from f. and l. pulleys. Side bottom outlet 2 in. i.d.

Six Portable aluminium alloy Open Top Tanks, approx. 7 ft. 9 in. long by 4 ft. 5 in. wide by 2 ft. 7½ in. deep, flanged top and fitted bottom end outlet 2 in. i.d. Vessel mounted on two iron castors with end castor pivot.

Six Portable aluminium alloy Open Top Tanks, approx. 7 ft. 9 in. long by 4 ft. 5 in. wide by 1 ft. 9½ in. deep, flanged top and fitted bottom end outlet 2 in. i.d. Vessel mounted on two iron castors with end castor pivot.

Complete Refrigerating Plant by Sterne, comprising Model 3U 4½, three cyl. ammonia compressor, vee rope driven by 35 h.p. Brook slipring motor, 400/440/3/50, with Erskine Heap oil immersed Stator rotor starter; shell and tube condenser, ammonia receiver, etc.

Complete Refrigerating Plant by Sterne, comprising Model 3W 7½, three-cyl. ammonia compressor, vee rope driven by 70 h.p. Crompton Parkinson slipring motor, 400/440/3/50, with Allen West oil immersed starter; induced draught condenser, receiver, etc.

(continued in next column)

SECOND-HAND PLANT FOR SALE

Gas-fired Boiler by Controlled Flame Boilers Ltd., type 6/H/S, No. 9688, tested 210 lb./sq. in.

GEORGE COHEN

SONS & CO. LTD.

WOOD LANE, LONDON W.12 Tel.: Shepherds Bush 2070

& STANNINGLEY Nr. LEEDS

Tel.: Pudsey 2241

MIXER and Pasteuriser. Stainless steel about 100 gal. capacity. Platford Scales, 3 sets. Vertical Retorts for canning, etc., 5 in all at £28 each. Fruit Stoning and Halving Machine. New 1954. Little used. Slicing and Cutting Machine with geared motor. For beetroot, carrots and rhubarb, etc. Mather and Platt Automatic Cooker Cooler. Variable can size up to A2½. Excellent condition. Little used. Bon Accord Can Conveyor. Approx. 200 ft. Variable can sizes. With bends and geared motor. Bruser Can Filler. Variable can sizes and speed up to about 80 cans per minute. Cherry Stalker and Washer with declusterer. Excellent condition. 50 ft. Belt Conveyor, 12 in. wide with geared motor and working tables. Both sides.—Write Park Farm Preserves Ltd., Winchcombe, Glos. or Telephone Toddington 212.

FOR Sale: Kellie Fruit Filterpress, Sugar or Juice Filterpress, Air Compressor, stainless steel Tilting Fruit or Peel Cooker 60 gal. B.C.H., Rotary Jam Cooler A.P.V., 40 gal. B.C.H. Tilting Jam Pan 100 lb. pressure, Gooseberry Snibber or Vegetable Cleaning Machine.—Box B5555.

118 PUTNEY BRIDGE ROAD, LONDON S.W.15.
Established 1875 Telephone VANdyke 2406/7

POWERMASTER Packaged Boiler, model 100, Available August. Can be seen steaming.—John Millar and Sons Ltd., Edinburgh, 9.

EXTRUDER, of American make, for macaroni or other extruded foods, exceptionally cheap owing to closing down of factory. Capacity 8 cwt. per hour. Complete with all motors and some ancilliary plant.—Box B5564.

VACUUM Can Seamer by Ashworth and Parker for sale. Auto feed, clinching mechanism, provision for lid magazine. Capacity 3⅛ in. diam. by 4½ in. high. Motor driven. Photo, etc.—F. J. Edwards Ltd., 359, Euston Road, London, N.W.1.

Pulsometer

Geryk VACUUM or PRESSURE PUMPS

RESEARCH WORKERS Save your high vacuum pumps for high vacuum work. Use this unit for the odd jobs.

Characteristics: 1. Portable. 2. Stands on the bench. 3. ⅙ H.P. motor with trailing lead. 4. Easy to clean and service. 5. Swept volume : 1 cu.ft/min. 6. Vacuum ·01 M/M. 7. Pressure 10 lb/per square inch.

Pulsometer Engineering Co. Ltd.,
Nine Elms Ironworks, Reading.

Gums & Resins

DAMAR·MANILA
KARAYA·ACACIA
SHELLAC·BENZOIN
TRAGACANTH

DIRECT IMPORTERS

M. HAMBURGER & SONS

LIMITED

Plantation House, Mincing Lane, London, E.C.3

Telephone: MANsion House 4405 (3 lines) Telegrams: Homaclon London

**pre-eminent*
in the manufacture and refining of:

EDIBLE OILS AND FATS
SHORTENINGS
COMPOUNDS
MARGARINES
PURE LARD

also **GEEM** SUPER QUALITY GLYCERYL MONO-STEARATE

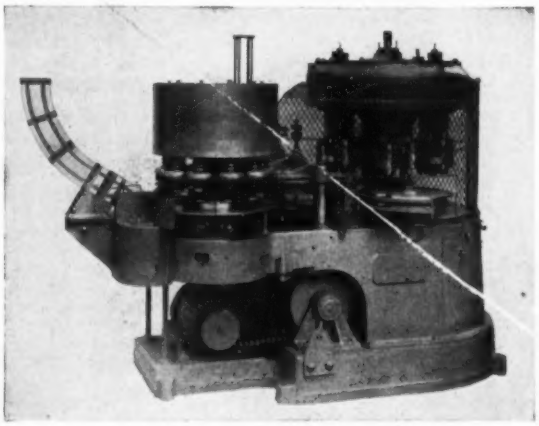
★ Consult us for keen quotations in bulk or small packages ★

London Oil Corporation Ltd.

MANUFACTURERS OF ELLOCEE PRODUCTS

Camberwell Grove, London, S.E. 5
and at Birmingham, Bristol, Leeds & Abram

High-speed Closing Machine



Fully-automatic, 4-head turret type double-seaming machine available for speeds up to 250 cans per minute.

Provision for steam flow.

As a Filler/Seamer unit, shown above, alternative types of 10-head fillers are available.

Specialists also in vacuum closing machines, gas charging boxes and soldering turntables for tagger lids.

THE PREMIER FILTERPRESS CO. LTD.

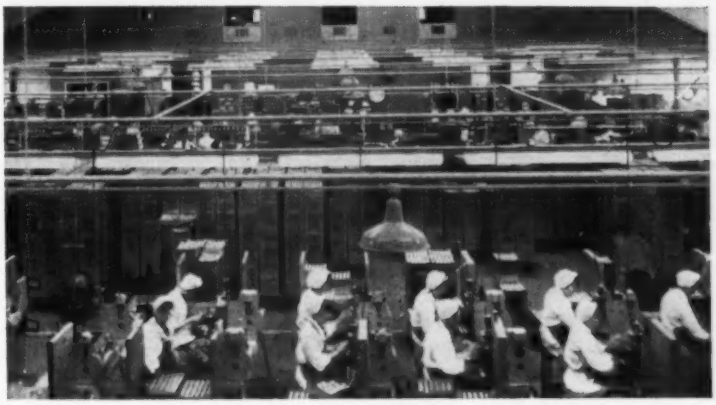
Grosvenor Chambers, Wallington, Surrey, England.

Telephone: Wallington 5572. Telegrams: Filtering, Souphone, London. Cables: Filtering, London.

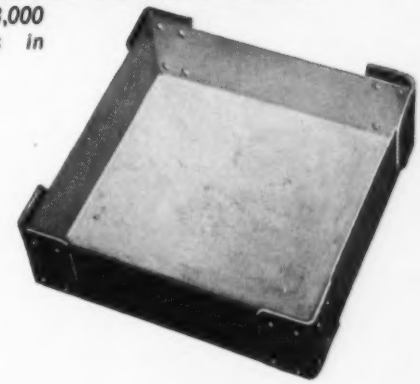
Printed by Billing and Sons Ltd., Guildford. Registered for Transmission to Canada including Newfoundland.

A Packing Problem Solved. . . .

by MESSRS. C. SHIPPAMS LTD. of CHICHESTER

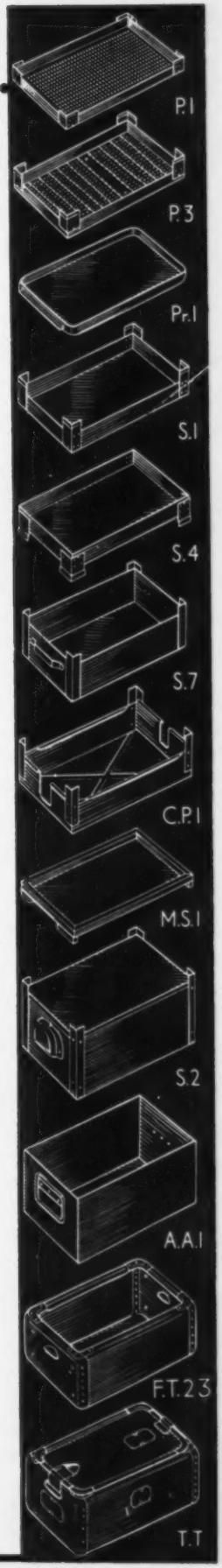


We depict above some of the 28,000 'Phoenix' Aluminium Sorting Trays in successful operation in this factory.



S.1 (Standard Corners).
Standard Interstacking tray, fitted with 10 S.W.G. corners, of general use where weight is moderate.

Enquiries for fully illustrated literature and particulars from Dept. F.M.



PHŒNIX *ALUMINIUM is the answer*

HESTON EQUIPMENT COMPANY LIMITED,

1 BUCKINGHAM PALACE MANSIONS, LONDON, S.W.1.

Telephone: SLOane 9934-5-6

MEMBER OF THE HESTON GROUP OF COMPANIES

Issued by the Gas Council

Mr. Therm burns to serve you

for your business is Mr Therm's business

consult your area gas board

the Gas Industry makes the BEST use of the Nation's coal